J. Nelson Spaeth.

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FOREST TAXATION EXPERIENCES OF THE STATES AND CONCLUSIONS BASED ON THEM [1]

By LOUIS S. MURPHY

Forest Economist, Forest Service.

Strangely enough, the term "forest taxation," even today, is not so much associated with the idea of taxing forest property as it is with the untaxing of such property. This has come about naturally enough, too, for when the earlier of these so-called forest tax laws were enacted there was no forest tax problem, such as we recognize it today. In the prairie region, where the forest tax concession laws made their first appearance, there was a forest problem instead. Since then, the forest problem has spread pretty much throughout the country and has accumulated in its train a tax problem as well.

It is well to recognize, however, that it is one thing to grant a tax concession to help bring forests into being where they have not previously existed in an amount sufficient to affect the tax revenue very greatly one way or the other. It is quite a different thing to attempt to offer the same concession to help continue forests in being where they, more often than not, are one of the mainstays of the tax revenue. In one case, without regard to revenue, we may make the concession such that it holds out a direct inducement to encourage forest growing. In the other we will do well if we can make the concession only such as will remove the tax discouragement to forest growing which the unjust burdens of the existing property tax law imposes—if we can merely substitute a fair revenue measure in place of an unfair one—but a

[1] This article expresses the author's personal views, which are not necessarily shared by the Forest Service. It was read at the Washington State Forest Conference, held in Seattle under the auspices of the School of Forestry, University of Washington, October 12, 1923.

revenue measure nevertheless. This, however, is getting ahead of and beyond the part of the tax question I have been asked to discuss.

The forest tax laws so far enacted, as you know, may be roughly classified as exemptions, bounties and prizes, rebates, special reduced or fixed assessments, and optional yield tax laws. There is no hard and fast line between any of these except possibly the last, and even here the idea of exemption often enters in. Exemption and rebate are terms sometimes used interchangeably in the same law. Similarly, bounties are in some cases allowed as rebates. Reduced or fixed assessments, also, are nothing more than an exemption of that part of the property value represented by the difference between the reduced or fixed assessment and the full value of the property.

Beginning with Nebraska in 1866, 28 States have resorted to these various means of attempting to encourage the growing of forests. Among the western timbered States, Idaho passed a tax exemption law in 1875, followed two years later by the then Territory of Washington. These various early laws have, in many cases, remained on the statute books down to the present day. In others they have been amended and amplified. Occasionally they have been repealed. But in any event in almost every case where still extant they have fallen into disuse.

Typical examples of the way these various laws have worked out may be found in Iowa and Indiana. In 1906, Iowa passed a law which has been continuously in force down to date, granting a reduction in assessment to $1 per acre to property owners who would maintain on their land a suitable forest growth. All things considered, this and the similar one in Indiana are among the most liberal concessions granted by any of the States. Furthermore, if anywhere, economic conditions would seem to have been such as to make it desirable and profitable for landowners to produce timber for their own use. Indeed this has been the case, for at one time there was a record of better than 200,000 acres of planted forest alone in the State of Iowa. How insignificant a part the 1906 forest inducement tax law has played in this forest planting, however, was recently very strikingly brought out by Professor G. B. MacDonald of the Department of Forestry, Ames, Iowa, and Deputy State Forester. Professor MacDonald, at a hearing of the Select Committee on Reforestation of the United States Senate, stated that while the timbered areas of the State was 2½ million acres, but 2,500 acres were classified under this tax law. In other words, but one-tenth of 1 per cent of the entire acreage, and about 1 per cent of

the planted acreage, which the law was especially intended to foster, were classified after 17 years.

Indiana passed a similar law in 1899. This law, however, was repealed some few years later, but was revived and re-enacted in 1921. The law, as recently enacted, appears to have aroused considerable interest. It is open to some doubt, however, to what extent this interest is in forestry. The number of applications for examination have been so numerous as to take up practically the full time of the State Forester, and to have recently necessitated the employment of a special assistant, a considerable part of whose time will be devoted to making tax law examinations. One country agent interested some 200 woodland owners to apply for examinations. In view of all this, the State Forester himself has expressed to the writer some disappointment in the results, since up to date (September, 1923) but 88 woodlands, totaling 4,195 acres, have been found suitable for classification. In very many instances it is found that the owner's interest in forestry is a nominal one only, or at least is overbalanced by his greater interest in using the woodland for pasture purposes, which use, under Indiana conditions, is entirely incompatible with forestry. Undoubtedly, the main cause for this volume of examinations arises from the possibility of securing a reduction in taxation, for, of the tracts so far classified, the State Forester gives the average value of the land as about $40 an acre. The exemption from taxation, if the property was classified, would thus amount to $39 an acre.

These two examples are outstanding ones of the generally abortive effect of this type of legislation. One could go through the entire list of States without finding a State in which as much as 1 per cent of its forest land area has been classified under these various types of tax inducement laws, including the States which have enacted yield tax legislation.[2] It seems perfectly evident that the States are not in a position to grant through these means a bonus large enough in itself, and unaided by other favorable economic conditions, to induce the growing of timber. On the other hand, when general economic conditions are favorable, timber is being grown in spite of general property tax difficulties. Indeed, from observing conditions in many of the eastern States, it seems evident that timberland owners hesitate to take advantage of these tax inducement laws when economic conditions are

[2] The new (1922) Massachusetts yield tax law promises better things, but to what extent this promise will eventuate into a fulfilment is only conjectural.

generally favorable enough for them to be actually engaged in growing timber. It was possible recently to check roughly this very situation when collecting data on the private practice of forestry for "Timber: Mine or Crop?" recently published.[3] It was found, generally, that while there was a considerable acreage in many of the Eastern States being managed productively, a very inconsiderable part of such acreage was classified under any of the so-called forest tax laws. Indeed, it was found that in some of the States which had no forest tax law whatever, there was a surprisingly good showing in the acreage under management.

There are possibly several explanations for this condition. The general property tax may really not be such a hindrance as we like to believe it. Forest property, by and large, may not now be so very excessively burdened by property taxation. There are unquestionably situations to be found, though, where it is now really burdensome. A fair assumption is, possibly, that these rather exceptional conditions may become more and more widespread as time goes on and, if so, a real tax menace certainly looms for the future.

The failure of forest property owners to take advantage of these forest tax inducement laws many times is unquestionably due to their unwillingness to become involved with the local tax authorities through the claiming of the benefits of such laws. Two new and typical cases of this sort have come to my attention while I have been preparing this talk. In one of them the owner, after complying with all the conditions for exemption of his plantations, received his proper certificate from the State Forester, and was told that the exemption would become immediately effective. His tax bill when received, however, was for the same amount as usual. Protest was then made to the State Forester, who apologized, saying that it was found that the certificate did not reach the local authorities until the tax rolls for the year had been made up, but that everything would be all right the next year. But it was not. The bills each year continued to be made out in the same amount as formerly. Each year for several years, until the forest plantation owner got tired of it, he wrote the State Forester, who, in turn, took it up with the local tax officials who appeared to agree to recognize the exemption thereafter, but never did. In the second case, the owner was granted the exemption promptly. The first year thereafter, however, the valuation on his other than forest prop-

[3] Separate 886, 1922 year book, U. S. Department of Agriculture.

erty was raised $200, the next year $200 more, and the third year another $300, without the valuation of neighboring property having been changed in the least. After unsuccessfully trying to have this discrimination corrected, he gave up and had his forest exemption withdrawn.

In this connection, too, a conversation is recalled with the State Forester of one of the States having a very simple and reasonably workable yield tax law, which aimed to do nothing more than to give the property owner a fair deal in taxation without special concessions otherwise. As recounted by him, the fact that a considerable portion of the tax for which the timberland owner is liable is deferred until he cuts his timber, makes it appear to the local authorities that he is being granted a considerable financial concession as indicated by the decreased amount of his current taxes. There is a disposition, therefore, for these local officials to scrutinize the property of any timberland owner seeking to have his forest classified even under the yield tax act, to ascertain whether or not his other property, usually farm property, is sufficiently fully valued. If this proved not to be the case, these other valuations stand a chance to be increased, so that the sum total of the annual tax payments would approximate the amount of the total taxes prior to classifying the forest land; this notwithstanding that the forest is obligated to the subsequent payment of a yield tax. Many timberland owners told the State Forester that they hesitated because of this to seek to take advantage of the obviously fairer method of taxation.

Another incident of the same sort occurred in connection with the recently enacted New Hampshire forest tax law, which law, by the way, is to all intents and purposes the same as those passed recently by the California and Oregon legislatures, but vetoed by their respective governors. Two foresters of my acquaintance have tracts of woodlands in New Hampshire which would be eligible for classification under the new forest tax exemption law. Upon inquiry of each of them as to their intention to do so, both signified that they would not hazard the chance of being penalized on the taxes of their other property by seeking to have the forested portion of the property classified.

All of these various considerations, it seems to me, lead to several important general conclusions. The first is, that in the absence of special constitutional authority, such as in Massachusetts and Louisiana, forest tax reform must be effected by general laws to cover all forest property under a plan of a classified property tax, and administered

by the constituted tax authorities. As a general thing, the authority of the legislature under the average State constitution is limited in tax matters to legislating for a class of subjects. Local or special tax laws are frequently expressly prohibited. The entering into any contract with the tax payer which thereby limits the general taxing power and even the commuting of the annual taxes into a single payment are likewise not infrequently prohibited.

Whether or not it would be possible to set up "new forests" as a distinct class of property to be covered by such general legislation, leaving "mature forests" to continue as at present under the general property tax law, is a question involving the constitutionality of such a separation. There are no definite and conclusive decisions that I know of on this point with reference to forest property. A closely analogous case, however, was recently decided by the Supreme Court of New Jersey, involving a special low rate of taxation upon new dwellings to encourage their erection in relief of the housing shortage. The Court, in this case, held that a new building differed in no essential respects from an old one, except as to its newness, and that this did not serve to set the new buildings apart as constituting a separate and distinct class of property. The reason, doubtless, why a parallel question has not long since been raised with reference to "old forests" and "new forests" under our existing forest tax legislation is that these so-called tax laws have usually become dead letters with the drying of the signature of the Governor who approved them. In the one instance of the sort which has come to my notice, it was simply necessary to threaten to raise the question of the constitutionality of the forest tax law, by which the local community would have suffered a reduction in current revenue, for the town to bluff the expected applicant under the law to withdraw his application.

Wholly aside from whether a classification of "old forests" and "new forests" would be a tenable one, the forest tax law, which becomes effective only at the individual owner's option, carries the question one step further into the twilight constitutionality zone. It attempts to subdivide the already doubtful subclass of "new forests." It provides that not all new forests, nor even all such forests as are being grown with the intent of the owner to practice forestry, shall be classified, but only such of these latter may be so classified as belong to owners who actually apply for such special form of taxation and publicly declare their intention to do thus and so. It seems inconceivable that subclassi-

fication of this sort could possibly receive the judicial sanction of the courts.

If we conclude, therefore, that forest tax reform can be effected only by general laws, including all forest property, mature and immature alike, we are forced to the second conclusion, that such laws must fundamentally safeguard the tax revenues of the local communities. Forests are an element of property and clearly taxable under our established property tax regime. Nor is there any likelihood that the property tax will be done away with in the very near future, at least, as a source of local community revenue. If we do not like the way the general property tax operates with respect to forests, we are bound to propose a method that will tax them in an equivalent manner.

We may reasonably expect State tax development in the future to follow along two lines. We may expect general property taxation to gradually give way to classified property taxation as a means of equalizing and readjusting the tax burdens now imposed upon certain classes of property. We may also expect new means of raising tax revenue to be developed in part, possibly, to lighten the tax burden now carried by property, but more especially to provide the additional revenue needed for the extension of governmental functions without further increasing the property tax burden. Property taxes will undoubtedly continue, as formerly, to be the main source of tax revenue, particularly for the subordinate political divisions of a State.

The country is alive as never before to the evils of tax exemptions. A strong movement is under way to amend the fundamental constitutional law, to the end that the tax exemption evil arising from immunity from taxation granted by the Federal constitution to the borrowings of public agencies may be done away with. It is accordingly unthinkable that any legislature, by general law, would place growing forests on the exemption list, leaving only the land to be taxed as has recently been proposed, even if it were possible to work out a plan of excepting from such exemption existing mature timber and leaving the exemption to apply only upon subsequent new growth. We cannot truthfully escape admitting that in the regulated forest, at least, the forest growing stock is a permanent feature of production along with the soil. Foresters, indeed, speak of it as "forest capital," which it is in very truth.

The property tax principle has been exceptionally free from capital exemptions. Intangible property is the one considerable exception,

and such intangible property has always largely enjoyed physical exemption through the ease with which it could be kept from the tax assessor's knowledge. Instead of exempting even this elusive intangible property, however, many States have resorted to the means of removing it from the general property category, making a special class of it, and subjecting it to an intangible property tax, but a property tax nevertheless.

In a few States income taxes were favored as a means of indirectly reaching this intangible property, the actual physical property itself being exempted from property taxation. Such income taxes, however, were not levied exclusively upon incomes derived from that particular source, but reached those derived from tangible property as well, notwithstanding the fact that tangible property had already been subjected to property taxation. This situation has aroused considerable resentment among the tangible property-owning class of income tax payers who object to paying two taxes against one tax paid by the owners of intangible property.

Whether or not those States which have already adopted the straight-out exemption of intangible property, coupled with an income tax, will be able to reimpose a property tax upon "intangibles," as a result of these objections of the tangible property owners, remains to be seen. Competent observers in the general taxation field are, nevertheless, of the opinion that such income and exemption combination, as a solution of intangible property taxation, has reached its limit with but slight possibility of its adoption by other States. Indeed, several constitutional amendments based on such proposals have been successfully attacked and defeated within recent years. Every indication of an acceptable solution thus points to the classification of "intangibles" and their taxation as property in such manner as to fairly meet the peculiarities of such properties.

If such a conclusion as to "intangibles" has any reasonable basis, it certainly seems as though the proposal now current to exempt forest capital from property taxation and reach it indirectly only through a business tax, where a State happens to impose one, would have little chance of being generally accepted.

New York has met a similar situation with reference to the personal property (machinery, raw materials, rolling stock, and the like) of certain corporations, by exempting such personalty from the local general property tax and imposing, in lieu thereof, a special corporation

franchise tax payable to the State and apportioned back to the local communities. Such corporations are, nevertheless, subject in addition to the usual business or other income taxes, as well as real property taxes. This is directly comparable to the forest tax plan adopted by several States, a tax being levied on the value of the stumpage when cut in place of an annual tax on the growing forest.

Concerning the exemption of annual farm crops, which is being advanced as a reason for exempting forest crops: Such exemption, in reality, is more apparent than real. The farmer still must pay taxes on the capital value of the implements of production (land, work stock, tractors, and other machinery, tools, storehouses, barns, and the like) used in producing such crops. He does not get off simply by a tax upon his bare land as the similar exemption of the growing forest would effect.

It is essential to note in this connection, too, that the farmer's exemption applies only to annual field crops or products. The farmer enjoys no similar exemption after the first year on his livestock, likewise a product of the farm, virtually a natural product of the land like the forest. The yearlings and older cattle and other livestock, the "growing stock" of the herd, are an element of invested capital and are subject to taxation. The annual increase in calves, lambs, etc., like the annual field crop, is exempt from taxation during their first year. Thereafter they become a part of the main herd replacing the older animals which have matured sufficiently to be marketed. The growing and breeding stock of the herd is thus maintained at a relatively fixed number of head year after year, whose value is a recognized capital value and as such is properly taxable.

The sustained yield forest is the exact counterpart, as I see it, of the livestock herd, and if all our forests were organized on that basis they would give us no more trouble to tax than livestock. Because they are not so organized does not justify us in seeking, and trying to justify, a solution through exemption of the forest growing stock unless we are prepared to justify also the exemption of livestock and of all elements of production used by the farmer, merchant, and manufacturer alike save the land, and thereby embrace the Single Tax on land values.

As the only practical alternative to the last-named course, my final conclusion is that the solution of the forest taxation problem is to classify forest property and to continue our efforts to find an equitable method of evaluating its productive capital value, land and growing stock together,

and taxing that value in a manner to yield at least the equivalent of a fair and equitable property tax.

This brings me technically to the end of the discussion concerning that part of the subject assigned to me to cover. I do not want to trench upon the part of the program assigned to the other speaker on the same subject, who is to develop it along lines of ways and means of avoiding past difficulties and of attaining a sound workable principle for the future. I would, nevertheless, like to add just a few words in explanation of my final conclusion so that you may not be left wholly up in the air as to the approximate means I have in mind for arriving at the capital, or productive, value of the property, i. e., of land and growing stock. I can possibly explain this most readily by an example.

Take a white pine forest property of 60 acres, organized on a 60-year rotation to produce a sustained annual yield of 800 board feet per acre per annum, worth $12.50 per thousand feet. Such a property would yield an annual income of $600. If we should conclude that because of the many uncertainties of forest production it should be entitled to an income rate of 15 per cent then, by capitalizing this $600 income by that rate per cent, we should find the capital value of such a property to be $4,000. That sum, then, would be its full productive value, and if other property was subject to a property tax upon its full valuation, this $4,000 would be the taxable valuation. If not, it would be subject to a percentage reduction to bring it in line with other property.

Now, contrast this valuation of the property, land and growing stock, as a productive entity with the value of the same property as usually assessed by the usual general property tax methods. Scattered through the several age classes above 20 years, there would be between 1 and 1½ million feet of sawlog stuff. The commodity value of that stuff, if put immediately upon the market, which is the criterion of value under the general property tax, would be, at $12.50 per thousand, between $12,000 and $18,750, in addition to the value of the land and other growth under sawlog size, the total value altogether, possibly amounting to between $15,000 and $20,000.

The difference between $4,000 on the one hand, and $15,000 or $20,000 on the other, marks the difference between a valuation on the capital, or productive, value basis and the present unfair and haphazard general property tax commodity value basis. I have proven, to my own satisfaction at least, that outside of forest property the vast majority of other property reached and taxed under the general property tax

represents capital value. It is productive property, and such we want also to make forest property. We want to put it to work, all of it.

There is no asking for the wholesale exemptions of the forest if this means of approach is adopted. However, it does eliminate a considerable amount of fictitious value which it is, or would in the future be, possible to tax under the present regime. It is largely defensible from another angle also. The question might be raised that the 3,000 board feet, for instance, that would be found growing in the 20-year old stand would be worth $37.50 if put immediately upon the market, and should be so taxed. Assuming that such amount might represent the correct value of that timber when it ultimately came to be cut, it, in all likelihood, would not be cut until that age class matured 40 years hence. Its value *now*, consequently, would be but a small fraction of that value, namely, the present value of that amount discounted back for 40 years.

Without trespassing any further upon your time with this idea, I will simply say that I am attempting to develop a general plan of this sort to cover all types and conditions of forest growth. In co-operation with a tax expert and legislative committee on taxation of one of our large forested Eastern States, I am in hopes that a practical tax plan may eventually be evolved along these lines, provided certain constitutional difficulties can be gotten around.

THE TAXATION OF FOREST PROPERTY IN THE STATE OF WASHINGTON[1]

By Carl M. Stevens
Consulting Forester.

Rudyard Kipling once wrote by way of introduction for one of his stories, that "As a general rule it is inexpedient to meddle with questions of State in a land where men are highly paid to work them out for you." It may develop that it would have been better for me not to meddle with the question of taxation for forest properties in the State of Washington for reasons somewhat similar to those given by Kipling for other affairs of State. Heavens knows enough people have been working at the problem up here. But Kipling goes on to say, "This tale is a justifiable exception." So that I am hoping that my entrance into this taxation problem will be another justifiable exception. Certainly, being once entered, there are reasons enough for a good honest attempt to extricate myself.

Always the Constitution of the State of Washington has been held up to me as an insurmountable barrier to proper legislation which will justly tax this new business, the growing of wood crops or the permanent management of forest areas for the production of successive crops of wood material. In the year 1910 a sub-committee on taxation of a commission appointed by Governor Hay reported a modification of the system of taxing timber lands in order to encourage "private capital to hold cut-over land for successive crops," and they said then, "It is understood that a constitutional amendment would be required before the above reform could be brought about." They do not say how they came by the understanding and they did say "the" reform. Much talk and writing very likely had preceded even this report. Certainly we know that much talk and writing succeeded the report and unfortunately much of it neglected to use such a word as "the" but said simply that nothing could be done. Each person interviewed seemed to have different language and different reasons and none of them seemed at all clear as to just why nothing could be done. It seems to me that

[1] Presented at the Washington State Forestry Conference, Seattle, October 12, 1923.

the people interested in this form of legislation in the State of Washington have formed a habit which is prefaced by the prohibitions which they have come to believe the Constitution contains and are not now thinking either of its exact language or of proper tax legislation.

Being to no extent hampered by habits of thought formed by a constant reiteration of the inhibitions of the Constitution of the State of Washington, I approached the tax problem for this State as I would that for any other State, along fundamentally correct lines for tax legislation to take. In a discussion some months ago with leading members of your Forestry Conference, we worked out a simple form of proposed tax legislation for the taxation of areas of timbered land to be devoted to the future business of growing wood crops. At the time this was done I expressed the view that, being fundamentally correct, such legislation might be admissible under the State Constitution. Again its prohibitions and inhibitions came up in the same vague form and I considered that I had gone far enough without finding out just what that Constitution did say. I secured a copy and much to my surprise found that the men who made it had put in, what appeared to me to be, a provision for just such contingencies. I honestly do not believe that I could improve on the language of that instrument if I were to have the privilege of rewriting it with a proper tax bill for growing forests in mind. It does appear to hamper much rather foolish forest tax legislation, but provides specifically for the correct kind. But please bear in mind, with all this, that though I have had much experience with taxes, I am not an attorney nor have I legal advice on this point. I want you all to form your opinion as I formed mine from the text itself.

There is a fundamental difference in the general scheme of things in business, as there is in the philosophy of taxation, between what I shall call "producing capital" and the "income or earnings" from that capital. Soil or land devoted to the production of wood crops, like the land devoted to the production of any other kind of crops, is true producing capital. Its value is theoretically determined by finding out what the soil will produce. Having once found this gross yield figure, a reasonable rate of return is allowed on the actual costs and on the investment in land and thus the actual theoretical land value itself determined. In the coming business of growing wood crops, the wood fiber itself will be the yield, and, to the extent not offset by costs, the net income; whereas the bare land itself is the capital. With other kinds of crops

the fruit or nuts may be the yield and the land plus bearing or producing trees will be the capital. That which I am attempting to define as "producing capital" and have here called real "capital" is property which because of its currently income producing propensity is properly subject to our ad valorem tax. On the other hand there is a general rule in our present day taxing philosophy which has become rather firmly established to the effect that "income or earnings" shall not be taxed until realized, in coin of the realm, or some other equally good and liquid or readily convertible asset which will give us the where-with-all to pay a tax on these earnings.

No attempt was made, in the effort I have spoken of as having been expended some months ago toward the preparation of proper forest tax legislation for the State of Washington, to prepare a bill in proper legal language and form. Perhaps we had Kipling's admonition in mind or, perchance, we recognized our own limitations. But the idea was simple, sound and easily explained. We said that in this approaching business of growing wood fibre for future commercial usage let's see first what simple, basic elements of business will be engaged. We shall start always with an investment in land. The land element is clear and easy to understand. We do not know its amount in terms of money for the books but we may start either with the present fair market value of such land in this general region or, later, after we have solved the other questions in the equation, with a theoretical calculation as to what land actually will be worth for the purpose of growing crops of timber. Always we must have in mind the particular kind of land involved, and we recognize that no two acres are just alike, and that certainly each property would be very different from every other. This is our permanent investment. This is our capital, our producing capital, the thing we shall always hold and the thing which we shall want to revalue currently as economic conditions change. This is property, that thing in the business of producing wood fibre which corresponds to the land and trees in a producing orchard, the capital investment in dam and power house for the generation of electricity, the investment in a building which we shall rent to tenants for offices, the railroads, the merchant marine and, well, any producing capital. Here we have the thing which should bear the ad valorem tax just as comparable capital in other kinds of business bears it. The actual cash value of this capital should be currently determined, just as it is for these other kinds of capital. Here, at least, is nothing fundamentally different.

And so we passed on and we said that in order to go into this business of growing wood fiber we must get the trees started on this land. The technique of such a process is so well known to you all that there is little use in further discussing it. We recognized that each piece of land would vary as to its powers of natural reproduction. We could see much land already started to a growth of young stuff and also much bare land. But we said there may be costs involved in this process and to the extent that they are, varying with each piece of property, we shall write them on the books as costs to be deducted from the first receipts, deducted from the gross income from the property in order to determine the net income.

Then we came to our current costs. We had granted that the capital value should bear the ad valorem tax and we had said that this capital value in land should be currently determined in order to keep it currently in line with other similar kinds of property. So we said that we would have that annual costs. We did not know just exactly what it would be per year, but we did know that it would not only be practically impossible to fix it but are also extremely undesirable, for hadn't we found that each acre and each property would vary in productive capacity, in accessibility, in cost for regenerative purposes, and so many other factors. We knew that the orchardist was not assured of his costs of a similar nature, nor were the owners of the power house, the office building or the railroads assured of their costs. We concluded, therefore, that with this timber growing business what we wanted to be assured of was not fixed costs but costs comparable to like items with other types of business. We would have also current annual costs for fire protection and suppression. We could not determine what these costs would be either, but we felt that we should expend our energy and money with a view to placing this business of timber growing on a plane also comparable to other business and attempt to reach a point where we were dealing with an insurable risk. We knew that organization for fire protection on forest lands had developed to a remarkable extent already in the State and the assistance of both Federal and State Governments in our forest fire department encouraged us to believe that we were dealing with something which might reasonably be expected to develop finally in a manner very comparable to municipal fire departments. Then finally we would have certain current administrative costs and overhead. These three items appeared to complete the sum total of our current annual charges. These were all costs and as the

money was spent it would be entered on our books as expense items which should be deducted from gross yield in order to determine net yield or income.

As we contemplated what we had that far done and approached the subject of yield we began to see certain differences between this business and some of the others with which we had drawn comparison.

Each acre of this forest property would not yield current return. We knew that the forest properties which were to be managed for the production of successive crops of wood fibre would be very largely organized in such a way that a certain portion would be cut yearly and that consequently a yearly yield might be expected. But it would not be quite the same thing. It would be as though we had an office building which had fifty separate offices in it, and each year collected the past fifty year's rent for one of the offices, and the next year from another office for the past fifty years, and so on. We knew that the orchardist had to wait some time before his orchard came into bearing but after that he had current income. And as we followed out this reasoning we saw another difference which had previously not been quite so plain. At least a portion of the investments in some of these other things were not in direct line with our kind of producing capital. Part of their money was tied up in depreciable assets and there it was: They got current return and charged off part of their investment as current cost. But we knew, too, that permanent railroads did not charge any depreciation but currently valued their properties in order to determine their capital investment. And after all, these items of difference seemed more apparent than real and we were left back again with capital, costs and returns.

And as we looked again at the yield, it had a somewhat familiar ring. Some one somewhere had said something about a yield tax in connection with this business of the permanent management of forest properties. But we had no room for a yield tax. We had already provided for full taxation of all of our capital like any other business and had nothing left but the earnings from our business. Were the earnings in these other kinds of business taxed? If they were, why, it was a reasonable presumption that ours should be taxed also and in like amount, but if they were not, then the earnings from our business should not be taxed either. This was a thing which could be left for general legislation on earnings of all kinds and there seemed to be no reason for splitting it off separately and providing for special treat-

ment of our particular kind of business, either differentiating against or specially subsidizing us. This business of producing wood crops would and could stand up with the rest.

But if we had no room for a yield tax in our program, why all this talk about yield taxes in other places? And here we came to a very particular and very special Washington situation. Out here, where we still had supplies of virgin timber left, forest properties could be yet organized in such a way as to bring into maturity some of the new crop before the old supplies of timber were gone. We could just shift the old business of wood utilization over a bit and make it permanent and by this process have a going concern all the time, one which would bring in current revenue from which to meet the current annual costs. Here was the old business our northwestern pioneers practiced years ago, excepting only that they assumed all our risks and only had half as much chance as we would have for gain. They could gain only by appreciation in what they bought and held while we would gain, not only by this factor of appreciation but by the accretion of growth as well. These older States were then discussing yield taxes only because they had let the situation go too far. They found it necessary to subsidize this business of growing wood crops because they had no supplies of timber which they could use to shift the old business over to the new. We found fixed rates of annual taxation at low figures and, though no one could tell what the difference between these fixed figures and properly balanced figures were, attempts to make up this unknown quantity by fixed percentages of the future yield, which factor also no one could know anything much about. We found advances to local communities provided by the States and all sorts of makeshifts to attempt to provide for the disruption of conditions.

But all too frequently we found attempts to patch up the situation by fixing specific figures for this and for that. Where we could provide and needed only to provide the factor of equavalency of burden for our business; letting it ride along like every other business with comparable costs which could be currently adjusted as changed conditions dictated the adjustment for all things, they must, apparently simply because they had let things slip along too far, tie this business, pregnant with nothing for the coming years if not with uncertainty, up to specific and certain figures. Everybody gambling now and in certain stated terms as to what was going to be the situation with the business thirty, forty or fifty years from now.

We must not pass on here without speaking briefly of these same virgin supplies of timber which make the shift from the old business to the new so simple in the State of Washington. Here we have an entirely different breed of cats, a horse of a different color. No one doubts but that the cost invested in these old virgin supplies of timber has become, with increased carrying charges, very heavy indeed, and this even though they were purchased at a very low figure years ago. But they were purchased years ago just as they stand now and are in an entirely different category from these new wood crops which will now be produced. The Federal Government has classified these old stands as wasting assets, as capital subject to depletion, where as for the new growth which is to come we have the classification of income. These old stands have always been taxed as property and this system may be continued quite properly. So we said, in our proposed tax legislation, that we will simply endorse and strengthen the start made by the Federal Government and we will simply continue to treat this old virgin timber as a wasting asset until it is gone.

Though we appeared to have no concern with the yield tax, still we knew that such procedure was being discussed in the State of Washington and even favored by some people in the State who were working to secure state legislation which would permit private companies to engage in the business of timber growing. We therefore tried to plan out a yield tax which would operate fairly equitably and not be too burdensome in administration. And here we found that we were up against an impossible problem. We already had seen that every acre and every property would vary greatly in the quantity and quality of yield, in accessibility both local and general, in regenerative capacity and many other things, and we knew that this variation would apply as well to the particular units as thousand feet board measure or cords as they would to the acre. For instance, we knew that the factor of accessibility would in the future control only the price to be paid in stumpage for particular trees, and not to any extent, as it does now, which trees are logged. So we must have a different yield tax for each different area and the different trees removed in any year. We knew, too, that certain operators would prefer to cut their trees young, on a short rotation, for the production of low grade stuff; while others would prefer to hold their trees on a longer rotation for the production of higher grade material. We could see that in the future some operators might prefer to thin their stands at an early age, whereas others

might let nature take its course. All these and many other things came in to throw out of joint a situation where other factors appeared fairly comparable. This merely strengthened our conclusion that in order to have any degree of equity in a yield tax it would be necessary to apply it to the particular material removed each year. This involved such tremendous administrative problems that we decided to leave the yield tax for those who were obliged to use it; that we would not tie the hands of those in the State of Washington who desired to engage in this business of growing wood crops, but would rather let the law of supply and demand take care of the product and the business, being careful only to see that this business did not bear an unequal burden when compared to the others.

With the preceding in mind, let's take a look at the essential provisions of the Constitution of the State of Washington and see how they fit in to our general line of reasoning.

"Article VII, Section 1.—All property in the State, not exempt under the laws of the United States, or under this Constitution, shall be taxed in proportion to its value, to be ascertained as provided by law. * * *"

"Article VII, Section 2.—The legislature shall provide by law a uniform and equal rate of assessment and taxation on all property in the State, according to its value in money, and shall prescribe such regulations by general law as shall secure a just valuation for taxation of all property, so that every person and corporation shall pay a tax in proportion to the value of his, her or its property: * * * Provided, * * * That * * * such * * * property as the legislature may by general laws provide, shall be exempt from taxation: * * *"

I have omitted some material which is not essential to the subject matter at hand and which does not change the meaning of the words actually quoted.

Without going into an extended discussion as to what most of the words quoted above from Sections 1 and 2 of Article VII of the Constitution of the State of Washington mean, which, by the way, I do not think mean anything like the construction allotted to them by many who have previously discussed this forest taxation program; can't you just see those good, sound old boys way back there working on this thing, scratching their heads as they came to close up Section 2, perhaps even visualizing this difference between capital and income, picking up the pen again and writing "Provided - that - - ."

The word "property" is much used and likewise much abused. In some parts of the United States, not so very long ago, it used to include

Negroes. Now, no matter what meaning is assigned, it very accurately describes that which I have not. It seems to me that the framers of the Constitution of the State of Washington had in mind the fact that, having used the word property, it might later develop that it might mean many things and they conceived at that time the probable necessity for exempting certain classes. And while they used the word exempt, and while we would take advantage of that word in framing legislation for the proper taxation of forest producing property, we must bear in mind that they used that word in connection with the word property and that we use it in the same connection. It is true that we are planning the exemption of certain kinds of so-called property from the operation of the ad valorem tax laws, but only such as are more properly called earnings, which same we are in turn using to determine the value of the real property, the income producing capital, which we are leaving to be taxed at its full value for all time. This exemption is merely the avoidance of double taxation and something which is just and right and nothing which can be frowned upon, as an outright discriminating exemption of any kind of producing capital might well be.

I have an idea that some of the members of this forestry conference who worked with me some time ago on this tax question may be a little bit surprised at the completeness of the reasoning process we went through at that time. I want to assure you and also them that in this statement I am not trying to bind them with me. These are my own thoughts and ideas and this is my reasoning. I am perfectly willing to take full responsibility for them. But, in all honesty, we did in that little conference hit the high spots along most of these lines. As a matter of fact, our discussion would not have been possible, and certainly our conclusion could not have been reached were it not for the fact that we had each, individually, been through this and many other lines of reasoning long before. This business of forest production will take care of itself if you will leave it alone. Simply make sure that this business gets a fair shake with all the others and permit the law of supply and demand to work on it. And last, but by no meanst least, let's not join the bunch from the Middle West—you know the gang I mean—in their howl for Government ownership, Government operation, and Government regulation.

COMMENT

By Burt P. Kirkland, University of Washington.

The foregoing articles by Messrs. Murphy and Stevens show very well the modern trend in thought on forest taxation. It is now coming to be realized that economic forces will bring about a valuation of the forest on the same basis as other properties which are based on their productive value. If this is true, taxation on this economic value is perfectly just. The principal need seems to be for better machinery to determine the economic value and assess it on an equitable basis as compared with other property.

Essentially, Murphy and Stevens differ only in their concept of what constitutes producing capital in forests. Stevens holds the view that the soil only constitutes this capital, while Murphy concedes the growing stock to be part of the producing capital. This virtually revives the old controversy between the "soil rent" and "forest rent" theories. Since the growing stock constitutes the greater portion of the producing capital, the writer believes it will have to be included among the taxable values.

In the State of Washington we are working along these lines, and joining forces with other interests to set up a competent State tax authority with power to supervise and compel equitable local assessment of all classes of property, including forests. Under this system we believe forest lands must be assessed on their value for producing timber in the early years of the stand. Later, growing timber values will be added.

By H. H. Clarke, Attorney, Washington, D. C.

Mr. Stevens' attempted abolishment of law by a wave of the hand, as it were, is so unique as possibly to merit brief comment. Thus, he proposes to consider separately the land and timber, taxing the former as invested capital, and the latter, not as property, but as income. It is suggested that, as the timber crop is income, analogous to annual crops, it should not be subject to the uniform ad valorem taxation prescribed by the constitution of that State, but should be put on a parity with other forms of income from invested capital. The author frankly ad-

mits that objections have been made that such legislation would be in conflict with the constitution of Washington, but brushes the objection aside rather naively with the remark that his own examination of that constitution disclosed clearly that the proviso to Section 2 of Article 7, reading:

"Provided, * * * That * * * such * * * property as the legislature may by general laws provide, shall be exempt from taxation"

affords complete authority therefor. He adds that he has omitted some material "which is not essential to the subject matter at hand and which does not change the meaning of the words actually quoted."

The pertinent provisions of the Washington Constitution are as follows:

"Art. 7, Sec. 1.—All property in the State not exempt under the laws of the United States, or under this Constitution, shall be taxed in proportion to its value, to be ascertained as provided by law.

"Art. 7, Sec. 2.—The legislature shall provide by law a uniform and equal rate of assessment and taxation on all property in the State, according to its value in money, and shall prescribe such regulation by general law as shall secure a just valuation for taxation of all property, so that every person and corporation shall pay a tax in proportion to the value of his, her or its property: *Provided*, * * * that the property of the United States, and of the State, counties, school districts, and other municipal corporations, and such other property as the legislature may by general laws provide, shall be exempt from taxation."

As above noted, Section 1 of Article 7 provides that *all property*, other than that exempt under the laws of the United States, or under the State Constitution, shall be taxed. This covers both real and personal property. It is equivalent to a mandatory declaration that all property in the State shall be taxed, ad valorem, with the exception noted. (State v. Daniel, 17 Wash. 111, 49 Pac. 243.) There is no clause specifically excepting growing timber. Hence, if growing trees are to be exempted from the ad valorem tax, and taxed at the time of harvesting as income, it must necessarily be authorized, if at all, by that portion of the proviso to Section 2 quoted by Mr. Stevens.

This proviso was under consideration by the Supreme Court of Washington in State v. Daniel, *supra*, in which a writ of prohibition was sought against the assessor of Spokane County, to prevent him from allowing certain exemptions prescribed by the statute then in effect allowing each person exemption from taxation on personal property to

an amount not exceeding $500, and on improvements on land to an amount not exceeding $500. It was contended that it was within the constitutional power of the legislature to create these exemptions, and the clasue of the proviso quoted by Mr. Stevens was relied on. But the Court said:

"Conceding to the framers of the constitution a knowledge of this principle of law (that the constitution is not a grant of power, but a limitation on legislative action), and of the further principle, referred to above, that the taxing power is inherent in sovereignty, and that the legislature possesses it under the general grant of the legislative power, entirely independent of constitutional provisions, we must conclude that the constitutional announcement that all property shall be taxed was not intended as a grant of power, but was intended as a limitation on legislative exemptions, if it had any office at all. But all effect as a limitation, as we have before indicated, is destroyed by adopting the contention that the words "other property," used in the proviso, give the legislature power to exempt all property. Thus it will be seen that this contention can be adopted only by imputing to the framers of our fundamental law ignorance of the force and effect of constitutional law, or an indulgence in declamatory vaporings. We do not think it necessary in this case to resort to imputation, but think a reasonable construction can be placed upon the enactment which will give intelligent force and effect to each separate provision of the law, viz., that the use of the expression "other property," in the proviso, was as a matter of caution, on the supposition that the special enumeration might not have embraced all public property, and that the changing conditions of society and of business, and changes of law, might create public property not then in existence. It is not unreasonable to conclude that in this connection they had also reference to property which is of a quasi public nature, and which it has been customary for legislatures to exempt from taxation, such as charitable institutions, public libraries, cemeteries, and a similar class of properties."

This opinion was rendered in 1897, and in 1900 the Constitution was amended in order to authorize the legislature to exempt personal property of bona fide resident heads of families not in excess of $300.

The court has held unconstitutional two subsequent attempts by the legislature to exempt property from taxation (State v. Parmenter, 50 Wash. 164, 96 Pac. 1047, as to money; Pacific Cold Storage Co. v. Pierce Co. (Wash.), 149 Pac. 34, as to vessels engaged in foreign or interstate commerce).

The interpretation placed upon the proviso in question by the Washington Supreme Court is, of course, conclusive, and a constitutional amendment would appear necessary to authorize the enactment of legislation to exempt growing forests from taxation.

FOREST TAXATION IN OREGON AND WASHINGTON [1]

By Geo. H. Cecil
U. S. Forest Service.

In the first place, what I may say should be understood to represent my own opinion only and not as expressing that of the Forest Service in general. The policy of the Service with reference to this subject may be said to be still in the making. Certainly as far as I know no official conclusions have been given out.

Considering first, taxation in a broad way, the subject really divides itself into two main issues—first the taxation of the mature, or, as I prefer to call it for reasons which will appear later, the virgin crop, and, second, the taxation of second-growth lands. The latter may be considered to include not only land artificially or naturally restocked, but also lands suited primarily for the production of forest crops.

In considering virgin timber the statement is often made that it is not considered advisable to undertake to secure any change in the form of taxation, but that attention at the present time should be directed toward more equitable taxation of second-growth stands. The implication is that when such adjustment has been made further effort will be in order to secure a change in taxation of virgin timber. While agreeing heartily with such efforts, where the object is second-growth lands held designedly for a second cut, I feel strongly that virgin timberland is in an entirely different category and that, aside from local injustices and inequalities between tracts, the present system of taxation is equitable. As I see it, there is a vast difference between the taxation of a growing crop, planted either by man himself or by Nature assisted by man, and protected by man, and a virgin crop established by Nature and protected by man only because an asset or necessity to his business.

Whether I am right or wrong in this conception has no bearing upon what we are now considering, which is the taxation of second-growth lands.

A great deal has been said and written on this subject by experts on taxation of which certainly I am not one. I have heard some of what

[1]Read before North Pacific Section, March 28, 1924.

has been said and read more. I have read what Murphy of the Forest Service has written to the effect that laws now upon the statute books of many of the States are inoperative; that in those same States timber is being successfully grown under the general tax laws rather than under the exemptions and bounties provided, inferring that the need for tax reform is a mental attitude rather than a necessity; without changing my view that if a forest crop is, as we all contend, a crop like any other produce from the soil, it should be so treated. In asking such consideration from the legislatures of our States I do not feel that the owner of forest land, on which he wishes to grow a second crop, is asking anything of a concession or exemption, but a simple matter of justice.

It might be said that the same argument would apply to orchard lands. Sure, it does and should. It applies to the growing of any crop where the realization is a deferred rather than an annual income. But on the other hand the public is entitled to the assurance that the land owner will go systematically about the production of a second crop. He must so cut his timber as to insure a regrowth, or failing that, plant it before he can have his land classified as "reforestation" land and placed or kept in the reforestation class, or whatever term may be used. He must go further and protect it with such assistance as the State and Federal governments may give him. If he does not do so and Nature provides a second crop and God and the State protect it, there is no difference between it and the virgin stand and he should pay on both land and timber. As I said to start with, these are only my own ideas on a subject on which two experts never agree, so I can hardly hope to have the agreement of you gentlemen. I believe fully, however, if we approach this subject of forest taxation from this standpoint we would go farther and quicker in our efforts to secure consideration from the public and action by the legislatures; and further, might hope to secure the active support of other growers of crops with a deferred yield.

With reference to specific legislation for the two States here represented. Several measures have been drawn and in some cases considered by the legislatures. The measure introduced in the Oregon legislature at its last session came very near embodying the points I have mentioned. I believe that the author [2] of this bill, in establishing for land

[2] C. S. Chapman, forester for the Western Forestry and Conservation Association.

in the reforestation class the basis that the assessed valuation should be no higher than the lowest upon which other wild land of the same character is assessed, was attempting to arrive at the market value of such land. It would, I believe, be unfair to tax the land throughout the rotation of the crop upon the basis of the lowest assessment of wild land. I do believe, however, that the basis should be the market value of the land. Similarly in the bill proposed by Dean Winkenwerder's Committee on Taxation for the State of Washington, I believe that the same idea of arriving at the market value is intended in the provision made that "All land chiefly valuable for the production of forest crops shall bear an annual tax upon the land based upon the value of the land for timber production." When all is said and done, the market value of the land is, I am firmly convinced, the proper basis for taxation. I would therefore change this part of Mr. Chapman's bill to read, "The assessor when making the annual assessment shall assess the market value of the land alone, not enhanced by reason of forest growth thereon. In the absence of an ascertainable market value, such assessment shall be upon no higher basis than the lowest upon which he assesses any other wild land of the same character."

I can not agree with Dean Winkenwerder, however, in his provision that "*all* land chiefly valuable for the production of forest crops" shall bear an annual tax upon the land alone. In my opinion to secure the consideration that should be given to a man growing a crop, the effort to grow such a crop should actually be made. If the owner of cut-over timberland is not sufficiently interested in the production of a second crop to ask for the classification of his land as reforestation land, but simply allows a second crop to come as it may, according to chance, I do not believe such a man is entitled to the consideration of the public which legislation of this kind proposes to give him. The public is interested solely in the production of a second crop of timber and it is only to such individuals or corporations as signify their intention of growing a second crop that the assistance of the public should be extended.

The proposed Oregon law, while allowing such land not bearing young growth to be classified as reforestation land, provides that, "If, however, it shall appear at the time of application or subsequently that further steps are necessary to establish satisfactory reforestation, classification or continuance thereof shall be conditioned upon the execution by the owner of a contract with the State, through the State forester, to perform such additional requirements."

The constitution of Oregon is in such form that it would permit of legislation of this kind without constitutional amendment. Such is not true of the State of Washington, and here it is proposed, in case of land in the reforestation class, to collect but 70 per cent of the land tax, allowing the other 30 per cent to accumulate as an additional tax until such time as the crop is removed. This in the bill is called a "yield tax," but as I understand it, it is not a yield tax in the ordinary sense of the word, since it is a deferred tax on land value only and not a yield tax on the growing crop.

There is one fundamental in which I differ from the authors of both these measures, and that is the proposal to reclassify the land at some future date when the timber upon it shall become merchantable so that both the land and timber are taxed, until the timber is removed. If the theory upon which we are working is sound, which theory is a tax upon the land value for the use to which the land is devoted, I can see no reason for reclassifying it when the crop becomes ready for the market. I believe that here, as in other localities, the tendency will be to cut too soon rather than to hold too long. The point has been made that such taxation would be necessary to prevent a man from holding land for hunting grounds, parks, or similar purposes. To my mind, that is providing for the hundredth case and something that I do not believe we can hope to do in any legislation.

Similarly, the point has been made that during the growing of the second crop, developments may render the land more valuable for other purposes than for the growing of timber. Here again I believe we would be trying to provide for the exception rather than the rule.

The original reason for providing by legislation for the immediate payment of a tax on the land value was in order to insure county revenue. While such practice is of course desirable and in reality necessary, I do not believe that this should be considered as the reason for such form of taxation. The real reason is that the land itself, and not the crop upon it, is what should be taxed.

It has been intimated that the land owner might find even this taxation difficult to meet. In the vast majority of cases, in these two States at least, the growing of timber will be part of an organized business the major objective of which will be the conversion of the material into logs or lumber, and it is only in the exceptional case that the owner of such land will not have revenue from other parts of his business sufficient to meet this annual tax.

HISTORIC SOURCES OF CONGRESSIONAL TROUBLE IN CONSERVATION

By Russell Watson

Assistant Professor of Forestry, University of Michigan.

Little men, it is said, may cast large shadows; and if this is true, much larger shadows may be cast by greater men. It is always interesting to cast back, down the shadows, to find the obstacles which throw them, and it is consequently of interest to follow back, and find the sources of the great conservation shadow that now lies over Congress. In other words, to determine how it has come about that Congress, and not the individual States of the Union, is particularly perplexed over conservation affairs.

We may confidently say that Alexander Hamilton, financier and statesman, and one small State, namely, Maryland, were the prime factors of throwing resposibility for present-day policies upon the shoulders of Congress; and it was the economic theories of Adam Smith that caused more of the trouble. They of course did not know they were going to cause the rumpus they have caused, although they could scarcely have dodged it if they wished. It is apparent that they did cause it.

THE MARYLAND CONTROVERSY

Trouble for Congress originated at the time of the Revolutionary War, and arose directly out of the trials and tribulations incident to the struggles of the Colonies against George III and their own attempts to form a United States.

The Colonial Armies needed men, and these were obtained by drafts or levies laid by the individual Colonies. In order to induce men to enlist, Congress about 1777 offered land bounties of from 100 to 500 acres each to non-commissioned and commissioned officers. This sounded good, but the unfortunate part of it was that Congress—or rather the United States—had no land, not an acre, to give.

The reason Congress had no land was this: The English Colonies were established under royal charters with grants of land in fee simply. Some Colonies surrendered their charters and became simply Crown

colonies, but not so with Virginia, New York, Massachusetts, and Connecticutt. Virginia, for instance, was given a charter for "all that space and circuit of land lying from the sea-coast aforesaid up into the land throughout from sea to sea, west and northwest." Others, more modestly, claimed only to the Mississippi River. Claims overlapped, obviously; and to complicate the situation still more, in 1763, the King set apart the far western lands as a sort of Indian Reservation, and placed the western limits of the Colonies at the eastern watershed of the Allegheny Mountains.

With the assertion of independence, the Colonies which had western claims, promptly established titles to these lands in accordance with their original charters; and in conformity with these wishes, the Articles of Confederation had left the sale and disposition of the western lands in the exclusive control of the States claiming them.

Congress thus, although it might make a gesture at giving lands, actually was trying to give away something it did not own; and to keep right, it asked the individual Colonies to give the lands it had promised. To this Maryland objected, and she objected for the very good and sufficient reason that she had no western lands "belonging solely and exclusively to her," nor any large amount of good lands at home to give away as bounty. That is, if Maryland were to give lands to her soldiers, she would have to buy the lands from another State to give.

Congress then said that *it* would buy the lands to give the soldiers, but again Maryland objected, saying that if Congress bought the lands from States (Colonies) having large western holdings, as Congress planned on doing, then that State would be made rich and developed by the soldier settlers. In short, Maryland felt that she was being discriminated against, and there now developed one of the most vexatious problems before the Continental Congress.

But all this argument was in time of war, was therefore bad, and needed to be hushed up. Congress needed soldiers, and guaranteed to get the land for them somehow; and Maryland raised her little quota, namely, 8 battalions. She did not, however, join the Confederation, but remained through the war merely an ally to the Continental Army.

She continued to press her claims. She insisted that "policy and justice require," that the western lands, "if wrested from the common

enemy by the blood and treasure" of all the thirteen States, "should be considered as common property, subject to be parcelled out by Congress" on terms beneficial to all the States. Feeling ran high. "We are convinced," a Maryland delegation said, "the same spirit which hath prompted them (those States which were ambitiously grasping at western territories) to insist on a claim so extravagant, so repugnant to every principle of justice, so incompatible to the general welfare of all the States, will urge them on to add oppression to injustice." Pretty strong words, and doubtless made the English chuckle. She continued, "Yet what evidences of that right (to lands) have been produced? What arguments alleged in support either of the evidence or the right?" The rhetorically put question she answered herself, defiantly, "None that we have heard of deserving a serious refutation."

"We have coolly and dispassionately considered the subject," they said, "We have spoken with freedom as becomes freemen" (a bit of natural pride of station there), and "we do instruct you (confederation delegates) not to agree to the Confederation, unless an article or articles be added thereto in conformity with our declaration." Maryland's protest was so sincere, and obviously of such good common sense withal, and further, other States joined in the complaint, that on October 10, 1780, Congress resolved:

"That the unappropriated lands that may be ceded or relinquished to the United States by any particular State shall be disposed of for the common benefit of the United States and be settled and formed into distinct republican States. . . .

"That the said lands shall be granted or settled at such times and under such regulations as shall hereafter be agreed on by the United States in Congress assembled."

Congress then brought all pressure to bear upon the individual States to cede peacefully to the Nation their western holdings. New York was the first to do so, and with a grandiloquent, half-amused sort of an air, on March 7, 1780, instructed her delegates:

"Whereas, nothing under Divine Providence can more effectually contribute to the tranquility and safety of the United States of America than federal alliance, on such liberal principles as will give satisfaction to its respective members: And whereas, the Articles of the Confederation and perpetual Union recommended by the Honorable Congress of the United States of America have not proved acceptable to

all the States it having been conceived that a portion of the waste and uncultivated territory within the limits of claims of certain States ought to be appropriated as a common fund for the expenses of the war: And the people of the State of New York being on all occasions disposed to manifest their regard for their sister States, . . ."

Thus they gave to the Nation their "waste and uncultivated" territory (there is a hint in that line of fox and sour grapes); and the other States soon followed suit.

The result of all this was to throw definitely upon the shoulders of Congress the responsibility and the entire burden of disposition of the national natural resources contained in the public domain. Congress accepted the burden, and the misuse of the forest resources of the country apparent today, must be laid directly to its doors. It was Congress that allowed our forest resources to be sold for a song, stolen for a tip, and exchanged for a drink of whisky.

One should not forget, however, that it also was Congress who authorized the National Forest Reserve, and has steadfastedly held to them now for more than 30 years.

Thus by accident, as it were, of kingly charter, States' rights propaganda and not apparently by any inexorable laws of human drifting or economic movement, Congress, located in Washington, D. C., on the eastern seaboard, obtained control over all lands of the West, and to this day controls more land west of the 105th meridian than do the individual States of that region. The geographic position of Congress (i. e., in the East) far from local influences affected profoundly all future conservation movements of the West, but even more than that, the centralized control over all the natural resources (which went with the land) of all the regions acquired, influenced even more profoundly all policies and efforts in conservation.

INFLUENCE OF ALEXANDER HAMILTON

Congress, under the Constitution as finally adopted, "had the power to dispose of and make all needful rules and regulations respecting the territory" thus obtained, and to this end the House of Representatives directed Alexander Hamilton to provide a plan for the diposition of the vacant lands (public domain) of the United States. It may seem a bit paradoxical that a Congress, which, as one observer says, was

too poor to own a capitol and too weak to protect itself against a band of ragged mutineers, should yet nonchalantly order the disposal of many hundreds of millions of acres of exceedingly rich land. The richness and value of the land was not then, in the 1780s, appreciated, to be sure.

Hamilton was a brilliant financier, but he combined with this a strong leaning toward national control. He had witnessed the petty bickerings between the States, and doubtless believed that the much desired and oft-quoted tranquility between States could only be obtained by strong federalist action. "A government," he said, "ought to contain in itself every power requisite to the full accomplishment of the objects committed to its care—free from every other control but a regard for the public good and to the sense of the people. Every power vested in a government is in its nature sovereign and includes by force of the term, a right to employ all the means requisite and fairly applicable to the attainment of the ends of such power—and which are not immoral or contrary to the essential ends of political society."

"There ought to be no limitation," he says again with such vigor that Justice Marshall himself felt he could not improve upon it, "of a (governmental) power destined to effect a purpose which is itself incapable of limitation," as for instance, the welfare of the people. The Nation in other words, should be the sovereign State.

He recognized, of course, as did all, that the Nation needed much money to pay the debts of the war. He could not levy war taxes upon the people directly because of the strong States' rights feeling against this. Consequently, he promptly seized upon the one article that Congress now owned in abundance, namely, land. Land the Nation had; more land than it knew what to do with, stretching nobody knew how far westward,—except to the hazy South Seas—illimitable, vast. The Nation was land poor. Never, it seemed, could all the land be occupied. With such an abundance of land on hand, why not sell and dispose of all possible? The answer obviously came in the affirmative; it should.

"In obedience," therefore, "to the order of the House of Representatives of the 20th of January last (1790), the Secretary of the Treasury respectfully" reported (on July 20, 1790):

"That in the formation of a plan for the disposition of the vacant lands of the United States there appear to be two leading objects of consideration: one, the facility of advantageous sales according to the

probable course of purchases, the other, the accommodation of individuals now inhabiting the western country or who may hereafter emigrate thither. The former as an operation of finance, claims primary attention."

Hamilton drew upon a report submitted five years before by a committee of five, with Jefferson as chairman. This report detailed methods of disposing of public lands, and adhered closely to the land scheme of the New England colonies, particularly in advocating townships and insistance upon surveying the lands before disposing of them.

In his report Hamilton planned the scheme of land offices, surveyors-general, deputies, fees, and in general the machinery of the General Land Office as it exists to this day. "All of which is humbly submitted by Alexander Hamilton, Secretary of the Treasury."

There are several features of the scheme of land disposition which Hamilton devised that are of great interest.

1. Land was not to be disposed of until it had first been surveyed and examined, that is, until a report was obtained from deputized surveyors who reported under oath the character of the sections.

2. The land was to be surveyed into rectangular sections of one mile square. Title was based upon these surveys, and checked a tremendous amount of boundary quarrels.

3. Land was not to be lavished on favorites, nor given away. Congress was a jealous god, and in the early days did not give away land lightly. In fact, the early statesmen held that to *dispose* of the public domain did mean to *give away* the public domain.

4. But most important of all, Congress did not at all recognize the importance of natural resources, and made no provision for control over development of the resources of the regions. When it disposed of the land it gave title to all that was on or in the land; and never did it reserve (unless it be in one or two unimportant instances) the timber on the land, or sell the timber and reserve title to the land.

As a consequence of this last provision, he who bought timber must also buy the soil; and if the individual had no interest in the soil, he naturally disposed of it in whatever manner he could, after disposing of the timber.

It is easy, of course, nowadays to look back and to criticise, to say that Congress should have allowed sale of timber from non-agricultural lands but kept the lands itself, as Canada has done; that it should

have sold timber only to bona fide timbermen who would agree to use a modicum of care in cutting the forest, and not to speculators who, at the present day caught with an expensive forest on their hands often cry loudly for reduction of taxes in order that they may carry longer and get higher stumpage prices; that it is sign of stupidity to believe that much revenue can be obtained from sale of wild lands, and it is easy to point out that the National Forests today might be sold on the market for more dollars than the United States obtained from the disposition of all the hundreds of millions of acres of much better land during the past 150 years; and that certainly all the present trouble over forest conservation and conservation in general might have been avoided if Congress had only appreciated the value of these resources.

But such *ex post facto* cavillings are of little avail, and are unjust toward the statement of those Revolutionary days. Twenty-four centuries ago a Greek warrior wept in his cups over the stupidity of his chief, who might have done the right as easily as the wrong. Washington and Hamilton alone seem to have a glimmering of the value of these resources; the rest, so far as is apparent, gave little thought to the problem.

However that might be, it is very probable that if the land had been given uncontrolled to the individual States, to dispose of as they wished, that it would all have soon gone into private exploitation. From the point of view of forestry it is a very fortunate thing that it did not; but certain former cabinet members and Congressmen might today be happier if it had.

So long as the title to the unoccupied public lands resided in the United States, obviously the Western States could not obtain money from them in the form of taxes. Western States memorialized Congress about 1832 to pass title of the lands to them. In order to embarrass Henry Clay politically, the House referred the matter to him. He said: "It is difficult to conceive a question of greater magnitude than that of relinquishing this immense amount of national property. If it were transferred to the new States, the subsequent disposition would be according to laws emanating from various legislative sources." He drew a most woeful picture of the results: "Collisions between the States," "a spirit of hazardous speculation would be engendered," "gigantic and tempting but delusive projects" would be established, and "the history of legislation in some of the States of the Union admonishes

us that a too-ready ear is sometimes given by a majority in a legislative assembly to such projects."

One of the most serious efforts was made in 1910 by the State of Colorado to break the hold of Congress on public domain, when its Attorney General was sent to Washington to argue the matter before the U. S. Supreme Court. The court held against Colorado unanimously: "No tax can be laid upon the public lands by a State or power other than Congress" says the court, and restates the principles long laid down, "No State law, whether of limitations or otherwise, can defeat the title of the United States to public land within the limits of the State." And again: "This power is vested in Congress without any limitation."

Rumblings of this question of the State's right to the public land within its borders are still to be heard. Scarcely three years ago, or just 140 years after Maryland had successfully brought all lands under control of Congress, the State Board of Forest Commissioners of the State of Washington, said:

"We reiterate and maintain that the National Forests and other forest lands under Federal control, excepting military and scenic reserves, should be ceded to the State, and until that time the Federal Government should pay" taxes to the State for the lands thus held.

It is an outworn theme. Congress has allowed, and will probably continue to allow, the public domain to pass from its hands only at such times and in such ways as it sees fit. Between Hamilton and Maryland a pretty secure job was done.

THE INFLUENCE OF ADAM SMITH

If our American Constitution were to be rewritten today it is probable that a word would be said curtailing the privilege of an individual to exploit his lands to the detriment of the country. The old Roman law has it this way: "No man can do that to his property which, if done by all, would destroy society." When one views the remains of our great forests, the resulting social decay, and dismal dilapidation, of the communities that thrived upon the wealth which flowed from the exploitation of those forests, one is tempted to wish that the old Roman law were included in our Constitution. Congress has the power to promote the general welfare of the people, but it has nothing specific in the way of police power assigned to it. It can not even prevent use of child labor.

Now it is probable that extreme limitation of power of Congress in this regard may be attributed directly to the influence of Adam Smith, the British economist who did most of his writing during the period 1760-1780. He elaborated, shortly before the Revolutionary War, at great length and much plausible argument, in his famous book, "Wealth of Nations," the doctrine of government non-interference, or *laissez-faire*. "Let every man," said Smith, "pursue his own interest in his own way upon the liberal plan of equality, liberty and justice, to bring both his industry and capital in competition with every other man, in short, the mercantile system, which in its nature and essence is a system of restraint and regulation."

This policy Smith carried to great extremes. He deprecated attempts of the Government to regulate or foster banks, forestry, commerce, etc. A Government should own land, he says, only for the purpose of parks and drives. He criticizes the French Government's efforts at forestry; and he is especially keen to do so because Smith's system of economy was essentially a reaction and a rebuttal to the scheme devised by Colbert, the great prime minister of Louis XIV of France. Colbert, it will be remembered, published in 1669 his famous forest ordinances, in which he put strong governmental regulations upon lumbering. He not alone regulated forestry, but even standardized small articles of merchandise, to the size of cloth pieces to be sold, etc. His over-emphasis upon regulation was sure to stimulate reaction; and this reaction Smith led about 100 years later.

Smith's arguments took strong hold in the United States. We were a pioneer people, proud of our individual initiative, resourcefulness, and strength. That man who successfully voyaged into a far country in a prairie schooner, hewed down the forests or broke the raw sod, defended the title to his land against Indians, squatters, claim jumpers, and whiskey stimulated desperados, naturally felt that he could well follow literally the plan of bringing his industry and capital in competition with every other man. We Americans have fought as part of our birthright, efforts of the Government to regulate or control our business. In 1882 after the terrible forest fires of 1881, more than three-fourths of the little township officials of Michigan voted against any State fire-fighting organization. They wanted no help in preventing or stopping forest fires. Let us alone, they said, there is too much State interference with local affairs as it is. And in Michigan we had to amend our State constitution before the State could legally

practice forestry on its own lands—otherwise it would have been in competition with private initiative.

The virus which Smith injected into our political and social body found an agreeable host. The resources at the end of the eighteenth century were considered limitless; they certainly were unknown as to extent, and were unsought. No one could possibly see use for all. If they were limitless, obviously there was no need of conserving them; and consequently no such measures were adopted.

Adam Smith's economic theories were, in a way, a forerunner of Darwin's theories of the survival of the fittest. To Smith, that man who had the most industry and best brains, succeeded; the others failed; and as a result, in striving to succeed, the public would be best served and the Nation made strong. But *survival* is the goal; and the ruthlessness of action of the survivor toward the resources he is exploiting were not considered as of importance. In efforts to survive, no thought is given to the economic consequences. In efforts to survive, the lumbermen have literally destroyed the forests of the eastern United States. As sure as can be, while this form of economic theory holds sway over our forest business, forests will continue to be destroyed. George Bernard Shaw wonders if men have the brains to solve the social and economic problems raised by their own great sudden aggregation. It may be wondered, also, if they have the nerve to break the grip of the exploiters of the forest.

Maryland threw the control of our public lands onto Congress. Hamilton, as a result of his strong Federalist views, prevented Congress from disposing of these lands to States en masse. Adam Smith checkmated Hamilton's ideas of governmental regulation by his own arguments in favor of unrestricted private exploitation.

As a consequence, we have some of both—restricted on Government land, unrestricted on private. The common-sense methods of cutting the forest that the Government insists upon practicing on its own lands, obviously because it feels it is the best thing to do for the welfare of the people, it has not the power to enforce—or will not enforce—upon private owners. It can but fiddle while the forests burn.

The individual States have the police power to check forest devastation. They will not. Congress feels that it should not, or can not. It appears that one's scared and the other dassent. Meanwhile, the indigent professor wonders how he can build a five-room cottage; and wonders particularly whether he had better not now buy a hillside so that his children, when they grow up, can at least have a cave to live in.

HISTORY OF LAND PURCHASE IN PENNSYLVANIA

By Alfred E. Rupp

Department of Forests and Waters, Harrisburg, Pa.

The importance of land purchase in Pennsylvania forestry is often overlooked, and not thoroughly appreciated by the average technical forester. The position occupied by Pennsylvania in forestry may be attributed largely to its ownership of State forests. There is no single activity of the department that reflects the executive ability and wise forethought of the pioneers in forestry in this Commonwealth, than that of land acquisition.

The most important factors involved in a policy of land acquisition are title, value, and location. Value and location are largely determined by the forester, but the question of title carries one back to the earliest history of the Commonwealth when all the land was possessed by the Indians.

The territory embraced in the King of England's grant to William Penn in 1681 was the first conveyance of title in Pennsylvania. This area embraced the original counties of Bucks, Chester, and Philadelphia, which did not extend any great distance north or west from the Delaware River. The grant from Charles the Second, King of England, to William Penn was intended to cover the entire area of Pennsylvania as we now know it, but Penn did not permit his officers to exercise authority over it, because it was held by him as belonging to the Indians. From the arrival of William Markham, Deputy of William Penn, until the year 1792, a period of 110 years, the whole right of soil of the Indians was in the charter bounds of Pennsylvania and all had been extinquished by thirty-three treaties and purchases.

The first treaty with the Indians was made by Penn, July 15, 1682, under the "Elm Tree," and the last treaty and purchase was made March 3, 1792, when 202,187 acres of land was purchased on Lake Erie and paid for from funds appropriated by the Supreme Executive Council. This land was located in what was called the "Triangle" and title of the remaining acreage passed to the Commonwealth through a purchase made by the United States Government to settle a dispute between the States of Connecticut and New York.

In the year 1684, Penn began to grant warrants and patents for lands in his providence, as "True and Absolute and Proprietary Governor," and was continued by his various successors until the passage of the Act of Assembly, dated Nov. 27, 1779, entitled "An Act for Vesting the Lands of the Proprietary of Pennsylvania in this Commonwealth." This act provided for several exceptions, such as manors or proprietary tenths, which had been duly surveyed and returned to the land office before July 4, 1776; it also authorized the payment of 130,000 pounds to the heirs of Thomas and Richard Penn, land proprietaries, as compensation for their land.

The students of Pennsylvania's development, especially during its first history, should always keep in mind the several purchases from the Indians, as they mark distinct periods in the settlement of the State. The jurisdiction of the Provincial or State Government of its counties was only considered as extending over purchased territory. Settlers were not permitted to locate permanently within other lines, and attempts to acquire title to Indian lands or to take possession of them were severely punished. County lines were extended, new counties formed, and land opened to settlers only as purchase from the Indians had been consummated. Therefore, the idea that all of the counties erected from territory of the three so-called original counties, Chester, Philadelphia, and Bucks, is erroneous. In fact, very few of our counties were ever included in their boundaries; but true parentage of any county is only traceable to the county which first acquired the land it covered after it was purchased.

Until about 1814 the erection of new counties, the selection of county seats, the transfer of judicial proceedings and other matters pertaining to county organizations, absorbed much of the time and attention of our legislatures. In nearly every instance efforts for the division of old counties and the formation of new ones met stubborn resistance. Petitions setting forth the hardships of those far distant from the county seat were met with petitions alleging that so many courts encouraged strife and litigation, multiplied public offices and expenses, increased taxes, and indicated lack of confidence in the State organization and government.

Early settlements in Pennsylvania followed certain well defined lines of travel, either rivers or roads extending from one military post to another. In the latter instance, usually the military post formed a nucleus around which farms and villages were established.

The division of the area into counties and the selection of the county seats has a very direct and important bearing on title examination work. Title to land from the Commonwealth must state its location as to county. In 1790 twenty-one counties embraced the entire area in Pennsylvania, and from these counties sixty-seven subdivisions were made, so that it is necessary in most cases to consult the title records on file in all the county seats to trace the proper warrant.

The conveyance of title to land from the Commonwealth is by patent. Patent is obtained upon application to the land office, now Department of Internal Affairs, for land situated in a certain township and county. From the description furnished in the application, the Surveyor General, after satisfying himself that the area applied for has not been patented, grants a warrant to survey. Upon the return of the survey accompanied by the purchase price, a patent from the Commonwealth is granted for the area surveyed. The land thus acquired may be sold by the patentee who conveys title by a deed. This is the beginning of what is known as "a chain of title." A clear title to land must be a record of an unbroken chain beginning with the owner and ending with the Commonwealth. The titles to land acquired by the Commonwealth for State forest purposes since 1900 show an unbroken chain, and when one considers the ease in which a title may become defective and thus become a broken link in the chain, the importance of this achievement must be recognized.

The forestry work in Pennsylvania was originally placed in charge of the Department of Agriculture, which was created by Act of Assembly, dated March 13, 1895. Section 4 of this act provided that among the officers of the department there should be a Commissioner of forestry. Section 3 of the act provided that it should be the duty of the Secretary of Agriculture to obtain and publish information respecting forest lands and the protection and preservation of forests and timber. The Act of March 30, 1897, provided that in all cases of sale of unseated lands for taxes, a copy of the publication of notice of sale should be forwarded to the Secretary of Agriculture and the Commissioner of Forestry, and authorized the Commissioner of Forestry to examine such land and, at his discretion, purchase the same on behalf of the Commonwealth at tax sale at an amount not to exceed taxes and costs, *and also provided that the Commissioner of Forestry should have power to purchase other lands on terms agreed upon with the owners of such*

lands, such purchases to be approved by the Governor and the Board of Property, consisting of the Attorney General, the Secretary of the Commonwealth, and the Secretary of Internal Affairs. Also providing that in no case should the amount paid for such lands exceed $5 an acre, and that the control of lands so acquired by the Commonwealth should be under the management of the Department of Agriculture but assigned to the care of the Division of Forestry, and should become part of the Forestry Reservation System, having in view the preservation of the water supply at the source of the rivers of the State and the protection from destructive floods.

The Department of Forestry was created by Act of Assembly on February 25, 1901. It provided that said department was to consist of a Commissioner of Forestry and four other citizens of the Commonwealth, who, together, should constitute the State Forestry Reservation Commission, each of whom should be appointed and commissioned by the Governor.

Dr. Rothrock was appointed Commissioner of Forestry, as one of the officials of the Department of Agriculture, on Sept. 14, 1895, and when the department was created, under the act above referred to, he became the Commissioner.

While the Act of 1897 authorized the purchase of lands by the Forestry Commissioner, with the approval of the Board of Property, yet nothing was ever done under this provision until the Department of Forestry was created and the Forestry Commission was appointed in accordance with its provisions.

The Hon. William A. Stone was inaugurated Governor of Pennsylvania in January, 1899, and the acquisition of forest land by private purchase was not begun until his administration. Prior to this time, however, purchases of forest land at tax sales was made. The first purchase was made in Cameron County in June, 1898, of 3,500 acres at approximately thirty-two cents an acre. The second purchase was made in Pike County of 9,409 acres at approximately eleven cents an acre. The purchase of forest land at tax sales was practically abandoned in 1900. On April 10 of that year the first purchase under a paper title was made in the Beech Creek region of Center and Clinton Counties, conveying 8,500 acres at $2 an acre.

The history of land purchase in Pennsylvania is not complete without mentioning the splendid work done by Mr. John E. Potter, President of the Potter Title & Trust Company, who examined and passed

upon all purchases made by the Department from 1899 until the present time. The employment of Mr. Potter for this work is best told by himself.

"In the fall of 1899, Governor Stone sent for me, explaining that under the Act of Assembly, passed 1897, the State was empowered to purchase lands for forestry purposes. He stated that forestry was very close to his heart and that he was particularly anxious that no stain should ever appear against his administration caused by 'rotten titles.' He then asked me if I would be willing to take charge of the examination, certification, preparation of conveyances, and settlement of the forestry land purchases by the State on exactly the same basis of compensation as if the work were done for a private individual or corporation. This I agreed to do, and my connection with the forestry work soon began.

"I shall always esteem it one of the greatest privileges of my life to have had the opportunity of close acquaintance with Dr. Rothrock. He had the attributes of true greatness; gentle, kind, affectionate, humble, unselfish, with never a thought of personal gain, absolutely honest, almost childlike in belief in men, but with a deep hatred of deception, falsehood, or wrong dealing. His favorite and, indeed, chief topic of conversation was the importance and value of the preservation and restoration of the forests of Pennsylvania and his supreme devotion to this cause reminded one of the missionaries and martyrs of the early church. Pennsylvania owes to Dr. Rothrock a debt which can never be repaid and never will be fully appreciated. Dr. Rothrock resigned as Commissioner of Forestry in 1904, but remained a member of the Commission until March 1, 1922.

"I found the work of the examination of the forestry titles very interesting, as it was quite different from the class of titles with which I had heretofore had experience. The great majority of the lands were what is known in Pennsylvania as 'unseated' or 'unimproved' lands. The practice had grown up in the early history of Pennsylvania, owing to the fact that there was so large an area of the State which consisted of mountain lands which were not capable of cultivation, of distinguishing such lands as unseated. As a general proposition, taxes assessed against lands are a personal obligation of the owner and in case of default in payment, should first be realized out of the personal property or the improvements located upon the land. In the case of unimproved land, however, there are no improvements out of which

the taxes can be realized and it, therefore, became a practice to consider the taxes against unseated or unimproved land as a lien against the land itself. This practice became absolutely necessary or the State and municipalities would never have been able to collect their taxes out of lands of such character. This system of tax sales of unseated land was founded upon an act passed in 1804, which was enlarged and improved by subsequent legislation so that early in the century the law and practice regarding tax sales of unseated land became well established. A tax sale of unseated land in Pennsylvania, where the land itself is actually unseated or unimproved, where the assessment is regular and the description sufficient to identify the property, and the question of interfering warrants or surveys does not enter, conveys the best possible title, divesting all prior liens and encumbrances excepting purchase money due the Commonwealth. This practice, therefore, affords an admirable method for correcting serious defects in the titles to mountain lands. It should be remembered that serious defects and adverse claims of title in the case of seated or improved lands can often be waived where satisfactory evidence is furnished of title by adverse possession for the statutory period. Adverse possession, however, can not operate in case of unseated or unimproved lands, so that if this practice of unseated land tax sales were not in force, there are very few mountain titles which would be marketable, for the reason that defects in titles to such lands are never cured by the statute of limitation.

"The practice and principle of unseated tax sale was well established quite early in the last century, and for this reason, mountain titles are an unusually clean and satisfactory class of titles where proper unseated tax sales have been held.

"Such titles, however, should receive very careful examination and consideration, for the reason that there are so many elements entering into such titles which may seriously affect their validity. In the first place, lands must be, as a point of actual fact, unseated and unimproved lands during the years for which the taxes were assessed upon which the tax sales were held. There must be no interfering or conflicting warrants, as payment of the taxes upon land itself by an adverse claimant, even if it is assessed under a junior survey, is sufficient to render the tax sale absolutely void. The law provides that owners of the land who are minors have until they become of age and two years thereafter to redeem the lands from tax sales. Titles to mountain lands are,

of course, affected by all other defects which may affect the title to any other class of lands, such as fraudulent conveyances, construction of wills, children born after date of wills, outstanding interests, trusts, tax sales, liens and encumbrances, and numberless other contingencies."

The title to approximately 1,265,000 acres of forest land was examined and reported on by the Potter Title & Trust Company, of which 1,131,277 acres have been acquired and are now State forests. The cost of title examination work was 11.5 cents an acre, of which 9.2 cents was expended for salaries and 2.3 cents for expenses. The department has purchased forest land before the lumber companies had finished cutting the timber, and in five cases purchased the timber on the land to prevent its removal. Approximately $15,000 was paid for the timber on 26,133 acres. The department also acquired title to 940 acres of vacant land, and received as a gift to the Commonwealth 1,226 acres. The most notable gift was the birth place of James Buchanan, the fifteenth President of the United States.

Economic conditions brought about by improved methods of making iron resulted in the sale of large tracts of forest land owned by the iron companies who used charcoal. It is interesting to note that some of these lands which were cut over on a rotation of about thirty years are now the most valuable areas in our State forests. The most notable areas are those at Pennsylvania Furnace, Caledonia, Greenwood, Pine Grove, Karthus, and Paradise Furnace. In the acquisition of over a million acres of land a complete record of the departmental activities is very essential and this record has been kept in,

First.—*The Offer Book.*—In this book, the location and area, price asked, action of the State Forest Commission and when reported on by the title examiner of all offers are recorded.

Second.—*Record Book.*—This book contains the deed records and when they are received from the title examiner. It also gives the date of the deed, when recorded, name of the grantor, consideration, location, and a description of the land.

Third.—*Consecutive Record.*—This book contains the date of the Auditor General's warrant for the payment of the land, number of the warrant, to whom payable, price per acre, area, township, county, and total amount certified to by the title examiner. From this book the status of land acquired is shown and must agree with the Auditor General's records.

Fourth.—*Township Record.*—This book contains the area of State forest land in each township and from which is determined the amount of money due each township on the payment of four cents an acre to schools and roads in lieu of taxes.

Fifth.—*Title Records.*—These books, which now total 161 volumes, contain the complete reports of the title examiners.

Sixth.—*Record of Deeds Transferred.*—The law requires that all deeds to the Commonwealth for land acquired to be filed with the Department of Internal Affairs, and this book contains a complete record of all deeds and title papers placed in the custody of that department.

Seventh.—*Maps and Surveys.*—The warrant maps which are the basis of all titles from the Commonwealth by warrant and return of survey have been prepared and now cover about 40 per cent of the land area of Pennsylvania. Land purchases were made, as a general rule, on warrant acreage which provides for an allowance of 6 per cent for roads and streams. Surveys were made to determine warrant acreage only and if the survey showed a smaller acreage, the area purchased was the acreage determined by the survey. It is fair to assume, therefore, that the surveyed area of State forest land exceeds 1,131,277 acres.

The wisdom of the policy that the department must be kept out of politics which was laid down by Governor Stone and Dr. Rothrock, and which has been adhered to by their successors, has been amply justified not only in the matter of examination of land titles, but also by the success of forestry in Pennsylvania.

THE EROSION PROBLEM [1]

Erosion Is the Cause of Many Calamities

By C. G. Bates

The erosion of lands by water action is such an insidious thing that it is not observed until some serious disturbance of the natural balance brings it to our attention.

The geologists tell us that erosion has played a large part in the present conformation of the earth's surface. A good example of erosive action is seen in the red rock formations which are particularly prominent at Morrison, in the Garden of the Gods at Colorado Springs, and elsewhere in the eastern foot hills. Presumably this layer of sandstone lay over a large part of the Rocky Mountain region, and when the mountains were thrown up, the sandstone, in broken blocks of greater or less extent, lay on top of the igneous formations, except where covered by lava flows. We seldom, now, find even small fragments of the sandstone in the higher mountains. It has been almost entirely eroded away by either ordinary weathering and water action, or by glacial action.

We thus see (and a thousand similar examples might be given) that in past ages an enormous amount of earthly material has been moved by water from the higher to the lower portions of the earth's surface. Erosion represents a general leveling-down process which will ultimately make this earth about as smooth as a billiard ball. Whether or not erosion is now going on as rapidly as in the past, considering changes in the earth's climate, changes in the vegetative cover, and so on, is really beside the point.

If erosion is such a natural an universal process, why should we concern ourselves about is, why attempt to prevent or retard the inevitable? Simply because man has such an enormous investment in the earth's surface. Man, being always near-sighted, has always thought of the earth as unchangeable. He has built absolutely upon the physiography of the earth as it is and with the exception of a few engineering feats such as the Panama Canal, the excavations for ore in Minnesota, and the moving of large quantities of rocks out of the stony fields

[1] Paper presented before the Denver Section of the Society of American Foresters, April 11, 1924. Twenty attended the meeting.

in the East, man has been content to leave the surface of the earth very much as he has found it. More than that, the surface of the earth becomes personal property, belief in the rights of personal property are almost a religion with all peoples, and no man likes to see his personal property disfigured, gashed or carried away en masse or by attrition. And so man has in every conceivable way resisted the action of nature in changing physiography. He has staked out cities on the banks of rivers, and then expended enormous effort to keep the rivers from destroying his cities. He has ploughed his fields in the rich soil of river bottoms and resists in every way either the cutting away of his land by the stream or its flooding and possible burying with inferior soil. He lays out his vineyards on steep hillsides, destroying the natural vegetation which has held the soil in place, and substitutes rock terraces to accomplish the same purpose.

From our standpoint as foresters, the erosion problem is quite largely a soils problem, and an agricultural problem, although we must also think of the human hives and human lives along river banks which may be destroyed by floods. We are concerned with keeping a little soil in the mountains, to fill in the spaces between our numerous rocks, and keeping that same soil out of the smaller streams where it merely detracts from the purity of the water; out of reservoirs which it will sooner or later render useless,[2] out of the larger streams from which it may erode, flood, bury and destroy the usefulness of agricultural land; out of the navigable streams, bays and harbors where it is an impediment to shipping and whence it can only be removed by expensive dredging.

In considering the erosion problem either at its source or its destination, the fact should be clearly borne in mind that the silt load carried by water gives to floods their most sinister aspect. In his bulletin on Forests and Waters, Zon quotes Demontzey as having shown that a certain stream in floods carried 85,020 cubic yards of water and 221,052 cubic yards of detritus, the latter having, then, the effect of *increasing the volume of the flood at least three times.* This is a point which we perhaps do not often think of. Unless one has opportunity to observe the deposits made by flood waters, or will collect a handful of muddy water cutting its way down a slope and note the amount of solid matter which will settle out of it in a few moments, he will hardly appreciate what this load amounts to.

[2] Roosevelt dam, not less than 3 per cent of annual inflow, possibly much more.

Now think of the worst floods in history and consider what relatively insignificant damage they would have done had the volume of flood water (and mud) been only one-third, or even one-half, of the actual volume. Many of you saw the Pueblo flood or visited the scene before the wreckage had been cleared away. How little would have been the damage in the business section of the city had the flood height been even 3 or 4 feet less? We have only the vaguest notions of the amount of silt carried by this water—only a small portion was deposited along the way where its volume could be estimated. But we do know that in Pueblo, and also on the farms in the Arkansas valley the damage would have been comparatively slight had it been a flood of *clean* water. On the main street of Pueblo nearly a foot of mud was left lying for a month, so much cleaning-up was there to be done elsewhere.

If now we add to this increased volume of flood by reason of the silt carried, the very obvious fact that each addition of silt, sand and gravel increases the abrasive force of the stream and causes it to become more and more erosive. It will be readily understood why we should say that the key to the flood problem is in the erosion problem, and why we should say that the key to the utility of forests as protectors of streamflow depends largely on the prevention of erosion, whether that prevention be accomplished through a grass cover, a shrub cover or a tree cover.

In their ardor to convert laymen to the patient philosophy of forest growing, foresters and the friends of forestry have made rash, untenable statements with reference to the influence of forests on streamflow. As an illustration of the extent to which the ardor of propaganda has carried our well-meaning and otherwise estimable friends off their feet, I cite the following statement by one of our best-known foresters: "The most permanent, effective, and cheapest protection against erosion, however, is a forest cover. Grass, while effective in preventing erosion, does not diminish the surface run-off, *and serves no other useful purpose.*" We would remind the writer of this declaration that not only is grass grazed, but that it is now, like our beloved trees, being used to make paper.

This statement, of course, is so absurd that it could not possibly do any harm, but I sometimes wonder whether many another statement fully as far from the truth as this, and more insidiously deceptive, has not been made about forest influences.

I take it that we are all gathered at this meeting for the purpose of obtaining by discussion new facts and new viewpoints which will lead

us toward the truth and assure the soundness and permanence of our activities on behalf of forestry. It is not my purpose to attack any specific theory as to the influence of forests on streamflow. It is my purpose to convince you, if possible, that the heart and kernel of the streamflow problem is in erosion, rather than in volumes of water, and that if we can not prevent erosion on the National Forests, we are doing little to justify our stewardship.

The idea that erosion is the kernel of the situation with respect to the assumed influence of forests on streamflow, has been forced upon me by the results of the experiment at Wagon Wheel Gap, and while these results have been accumulating, I have been attempting to satisfy my own mind as to how they could be reconciled with certain well-known facts as to the effects of denudation. Briefly, these results may be stated as follows:

1. For whole years since denuding one of the watersheds at Wagon Wheel Gap, the stream from that watershed has shown excess discharges amounting to 11 per cent, 25 per cent, 32 per cent, and 23 per cent, respectively for the 4 years. Expressed in different terms, for the 8 years before denuding, this stream discharged 29.2 per cent of the total precipitation on the watershed; for the 4 years since denuding it has never dropped below 29.2 per cent and has averaged 36.1 per cent, or a gain of just about one-fourth. Such a result is entirely in keeping with the well-known fact that trees put back into the atmosphere, by transpiration, more moisture than any other form of vegetation and more than would be evaporated from bare ground.

2. The greater part of this excess discharge occurs during the spring melting period, due in part to the fact that the snow melts more rapidly without the forest cover, causing the peak flow to occur about 4 days earlier than formerly and to be of greater volume. It is fairly evident that either before or after removing the forest, the storage capacity of the ground is at this time entirely utilized. It must be, then, that this greater flow is made possible by more prompt melting with less chance for loss by evaporation, and also by less evaporation loss through the winter, when the crowns of trees ordinarily intercept a good deal of the snow.

3. There is no diminution of flow through the summer as the result of this greater discharge in the melting period. On the contrary, there has always been a calculable excess of water in September, and for the entire summer periods the excess has averaged about 3 per cent of the normal flow of the stream.

4. The flow during the winter period is difficult to calculate by formula, but it is evident by deductions that there must be a slightly higher flow at this period also, resulting from the forest removal.

5. When we come to erosion, it is found that during the first year after denuding, the amount of silt collected in the measuring basins was about 125 per cent in excess of that which might have been expected; during the second year, 396 per cent; third year, 377 per cent; and, during the fourth year, 519 per cent. In view of the fact that a cover of aspens has rapidly reclaimed the slopes, this steady increase in erosion would be difficult to explain were it not known that it comes almost entirely from a road which was built in order to remove logs from the area, and from one or two skid trails down which the logs were dragged to this road. As is common, when once washing begins in such paths, it is likely to gain momentum until either vegetative growth, or accidental damming, puts a stop to it. However, I would call attention to the fact that the largest silt load so far carried represents but .001 per cent of the volume of water discharged from the area, so that the amount of the erosion is still not a serious thing.

I wish to call to your attention two aspects of these results which are not in accordance with our preconceived notions as to what should happen after forest removal. The first is that there has been no dearth of water in the stream at any season, although considerably more has gone down in the spring flood when it would be less useful for direct irrigation, but none the less, useful for storage. The second point is that, although about 20 per cent of the watershed area was burned over to destroy the loppings and the aspen which could not be used, there has been no erosion as a direct result of either the cutting or burning. Such erosion as has occurred has resulted from the mechanical act of removing the timber over a skid trail, and the building of a road across the stream to remove it further from the area. Please get this clearly: had the timber been cut and left on the ground, or burned, there would, apparently, have been no occasion for any erosion whatever. It is, therefore, apparent, that in practicing the most ideal silviculture, whether this involves removal of 10 per cent or all of the timber at one time, we have no guarantee that we are maintaining the protective value of the forest unless, after the logging operation, roads and skid trails are filled up with brush and practically obliterated. It is, possibly, true that after a light cutting, the normal fall of leaves assists in this covering operation.

This point can be illustrated by another example. On McKinney Creek, only a mile or so from the special watersheds at Wagon Wheel Gap, an area at the head of the watershed was burned. Prior to 1910, a road was built into this area, following closely the stream channel, in order to remove the burned timber for mine props. In the fall flood of 1911 a great deal of detritus was brought down this stream channel and deposited at the mouth of the cañon, while our "forested" watersheds nearby showed no such effects. Examining this watershed, we found it almost impossible to travel up the road, because in so many places the stream, partly dammed, had left its channel and flowed in the road, washing away a vast amount of fine material and even moving good-sized rocks. At the head of the stream, in the burned area, there was practically no evidence of unusual streamflow or of erosion. It is evident then, that the flood, or at least the damage cused by the flood, was the result of building the road to remove the dead timber, and not the result of the killing of the timber by fire. I am well aware that such a statement as this, assailing highly sentimental, preconceived notions, as well as the utilitarian sense of the purpose for which forests are possessed and grown, will be deeply resented by all conscientious foresters. But here are the facts, and from the facts as I have gathered them, I venture to make the assertion that any road, built with ordinary care and provision for drainage, and traversing a section of mountain forest land, will have and does have a greater effect on streamflow as measured in terms of erosion, than would the cutting of the entire section of timber, or its burning, provided that the burned or cut area was not afterward disturbed.

I do not propose to offer any solution for this problem beyond suggesting that instead of talking and thinking about the absolutely intangible and doubtful values of living trees as the protectors of streamflow values, we give heed to the roads, trails and skidways which are necessary in the development of the forests for any purpose, but which *are* the destroyers of our peaceful and highly-prized mountain streams. Let us face the facts squarely and try to realize that if we can prevent runoff water from picking up a load of silt, if we can keep the streams of water within the channels which are lined with rocks, roots and heavy vegetation, if, in short, we can assist nature in healing the scars which we make on our mountain sides, it is relatively unimportant whether the cover is of grass, shrubs or trees. It is perfectly true that the roots of trees bind the soil and keep it from washing away in large masses.

But it is also true that if we cut the trees, other vegetation will come in and assume the duties of the tree roots before they have rotted. Let us, then, put the emphasis where it belongs, not on the trees, but on vegetation of any kind as a means of preventing erosion. Let us not only keep this in mind with reference to our forest lands, where trees are the natural ultimate type of vegetation, but also in any place or under any conditions where we see men exposing the soil to the action of water. In reality, the biggest erosion problem is outside the forests, yet we control it at its source.

In the effects of grazing we have a case almost exactly parallel to the effects of road-building. Anyone who has observed will admit that a cow trail paralleling a stream or cutting down its steep banks is very likely to start erosion which may result in a deep gully. The experiment carried on in Utah has shown that over-grazing of a mainly grassy watershed greatly increases the silt removal. Unfortunately, we have no information as to whether this erosion was of the sheet variety, that is, from the entire surface, or largely localized in trails and along the water channels. Be that as it may, we need no experimental proof to convince us that over-grazing almost invariably starts serious erosion. When the forage-producing capacity of the land, however, is not being over-drawn, we may expect erosion to be of very moderate degree, except possibly around watering places. The prevention of erosion should be considered fully as carefully as the carrying-capacity of the range, in every phase of range management. I do not feel it necessary to go into this subject further, because the nature of the problem is so exactly similar to the problem, as I see it, of forestry. If one may judge by the literature on the subject (e. g., Bulletins 91 and 675), the grazing people have hit more closely to the heart of the problem than have we foresters, and have been talking about wholly tangible factors.

At the present time, grazing on the Tonto Forest is being reduced 50 per cent in order to check the erosion which is silting up the Roosevelt reservoir at the rate of 18,000 cubic yards annually (or perhaps much more).

The erosion problem of the country, which seems to me to be growing more serious year by year, is not one that we foresters alone can handle. Yet every year the opening up of the mountain areas by roads and trails, and the increased usage which this implies, is placing on us a greater responsibility for protecting these areas at the headwaters of streams. What has been attempted in this paper is merely to emphasize the prac-

tical and tangible effects of road building, of trail washing, of over-grazing, and all the other disturbing factors, in contrast with the largely sentimental and intangible theories as to the effect of trees themselves upon the flow of streams. To put the matter tersely, the preservation of the soil, rather than the trees, should be our concern in every one of our varied activities.

The actual steps by which erosion on the National Forests may be checked, and damage increasing in geometrical proportion prevented in the valleys of the larger streams, may be briefly stated as follows:

1. Prevent over-grazing, generally and in local spots, by the best methods of range management.

2. Avoid building roads or trails of any kind in valley bottoms where they may easily become stream channels, diverting the main stream from its natural course or collecting water which comes down the slopes.

3. In building hill-side roads or trails, neither dam nor divert any natural stream or dry gulley of any size.

4. Whenever possible, crown roads so that the water does not accumulate and run in the road.

5. On all low-speed roads, drain to the outside rather than to a ditch.

6. Divert road-ditch water frequently, and if possible, into natural gullies where the heavier vegetation permits the water to be carried without causing erosion.

7. Facilitate in every possible way the settling of road fills and all other loose embankments and the growth of natural vegetation on both embankments and cut slopes.

8. Require logging roads to maintain reasonable drainage while in use and when necessary to follow stream beds, to be protected against the stream.

9. Require both skid trails and logging roads which are not worth maintaining for forest administration, to be filled with brush when abandoned.

10. Scatter brush rather than burn it wherever the mineral soil and rocks are not well covered with a humus layer, but use it especially where the growth has been scarred and where grass and weeds are lacking.

11. Stop by dams, by fencing against stock, by willow planting or by filling with brush, the erosion of gullies already started.

TREND OF SILVICULTURE DEVELOPMENT IN GERMANY [1]

By J. A. Larsen

Development of sound silvicultural systems in any region marks time with slow and uncertain steps; slow because the entire field of biophysical factors must be discovered, interpreted and applied; uncertain because silviculture must, in most cases, fit both the forest conditions and the market, the latter with no fixed demands. Then just as the forester stands ready to reap the fruits of his studies and experiments, death beckons him away, leaving no assurance that his work well begun will be carried forward to fruition.

In an effort to trace the historical development of silviculture, we turn instinctively to Germany, where the most complete background in experimental silviculture exists, where conscientious effort and critical analysis have set down the success or failure of each innovation. The object is, therefore, briefly to acquaint the reader with impressions gained during a visit to some of the most typical forests in Germany, by discussions with several well-known German foresters and in reading of many technical articles, and to furnish references to articles which set forth more completely than is possible in this brief paper the descriptions and applications of certain methods now in use.

Originally the forests of Germany were composed mainly of hardwoods in which beech and oak were plentiful, and these must have enriched the soil greatly. A large portion of the land had dire need of this protection and accretion for chemically poor sandstones and conglomerates of the Triassic and Jurassic periods predominate, particularly on the central plateau sections. The deposits from these washed, leached and worn sedimentary strata have covered large portions of the lower north German coastal plains, particularly in Prussia.

The severe drains upon the splendid hardwood forests which began in feudal times increased through clearing, wasteful cutting, fire, and war until they reached acute stages in the sixteenth century.[2] To be sure, the abused hardwoods produced sprouts for a time but as this could not continue indefinitely, man was forced, by circumstances which

[1] Delivered before the Society.

[2] The student of developmental stages in German forest administration is referred to contribution by E. E. Fernow in Document No. 181, House of Representatives, 55th Congress, 3d Session, Washington, D. C., 1899, p. 205.

he himself had unwittingly created, to plant or re-seed the denuded slopes.

Fortunately the fuel value of coal was discovered after which the forests came into greater prominence for lumber production, leading eventually to a program of extensive planting of conifers composed of Scotch pine, Norway Spruce, and white fir,—Scotch pine chiefly in Prussia and Hessen and spruce in Saxony, Bavaria, Wurtemberg, and Baden, the last two embracing the Black Forests. There is, of course, a climatic reason underlying this, in that the higher portions of Saxony, Thuringia and the Bavarian table land, as well as the hilly regions of western Germany, including Spessart and the Black Forests, receive a rainfall up to 34 inches, while the lower northern plain gets only from 20 to 26 inches a year. The higher land is better suited to spruce production and the lower plains better adapted for the growing of pine. The influence of soils and climate on the production of wood in Germany is set into strong relief by a comparison of the gross incomes per acre from the various German forest regions, which are as follows: Prussia, $3.08; Bavaria, $4.23; Saxony, $7.24; Wurtemberg, $7.38, and Baden, $8.64.[3] The first two of these have soils derived from sedimentary rock, the last have soils enriched by igneous rock.

Management of these artificially established coniferous forests was as simple as it was easy. The system of general use was Kahlschlag—clear cutting and planting. This reached the acme of success in Saxony where planted spruce forests would yield 50 to 100,000 board feet per acre in 100 years and show net earnings up to 5½ per cent, and up to $5.17 per acre per annum. Needless to say, this system also took root in Bavaria and Wurtemberg. It was even applied to the pine areas in Prussia and Hessen and Pomerania.

However, toward the latter part of the last century much dissatisfaction arose from the use of this clear cutting system and planting, both as applied to spruce and pine forests in pure stands. In Saxony there is much injury by wind, snow, smoke, a defoliating caterpillar, and, worst of all, by the fact that pure stands of spruce, when exposed by clear cutting or undue openings, fail to maintain an ideal forest soil. Bacterial life and activity in the soil ceases, the soil changes color and becomes covered by a dense kind of peat moss which prevents moisture from entering the soil. All these disadvantages have been well described in the JOURNAL OF FORESTRY, Vol. 21, 1923, p. 720. The writer

[3] Zon and Sparhawk. Forest Resources of the World, 1923, Vol. 1, p. 146.

had occasion to see this in Bavaria. When the moss takes hold, natural reproduction is out of the question. Still another serious drawback, resulting from planted pure spruce, is the very high percentage of butt rot in the planted forest. In many cases this affects 90 per cent of the trees. Adjacent stands of naturally-sown spruce are comparatively free from butt rot. On the Sihlwald in Switzerland, butt rot in young planted stands of spruce was very serious. This disease becomes more acute as time progresses and it explains the much greater damage by snow in young stands of planted spruce compared to naturally-sown stock.

In view of this situation, skepticism and misgivings resulted as to the advisability of continuing this system. But though tenaciously retained and championed by many foresters, the final smashing blow came with the alarming fall off in production. The announcement that on one typical Saxon forest the receipts had dwindled from 2.66 per cent in 1873 to 1878, to 1.49 per cent in the period of 1903 to 1908, leveled the last barrier of opposition.

In the pure pine forests of Prussia, also, the story has a similar ending. Here the successive clear cutting resulted in serious insect damage, soil deterioration, windfall, weeds, and frost injury to seedlings. These matters have been more fully put in English by Recknagel in the Forestry Quarterly, Vol. II, No. 2, p. 135. In Wurtemberg, also, where the foresters have held tenaciously to the clear cutting and planting of spruce and fir forests, the pendulum is swinging toward mixed forests, shelterwood cutting and natural reproduction.

There was, therefore, a pretty general revolt against clear cutting and artificial regeneration of stands, and against the use of pure forests. New systems of silviculture which aimed at soil and site building, natural seeding and protection from frost and insect injury, were devised. Foresters began to think of the shelterwood system—Blender or Schirmschlag—long since advocated by Hartig, as well as the selection method—Plenter or Femelschlag, and group selection with various modifications and the border selection and border shelterwood cuttings, there being simultaneously an awakened interest in the hardwoods, particularly the beech, as nurse crops. Fortunately in the multiplication of industries and the more varied demands of the present than the past generation, hardwoods were not only desirable but necessary.

A shelterwood method of recent development is the Eberhard Schirmkeilschlag, or shelterwood wedge system, which is particularly designed for silver fir. After the forest has been brought to maturity by several

successive thinnings, the canopy is opened sufficiently for natural reproduction. This begins 20 to 25 years before final removal of the overhead trees. The ground is prepared to receive the seed by hacking of the soil or removal of vegetation and litter in strips or in squares. Final removal of the overhead progresses in the form of wedge-like, successively enlarged openings which progress against the prevailing wind.

Of comparatively recent origin are the various modifications and applications of the shelterwood system of cutting, such as the Wagner border shelterwood or Blenderaumschlag, the Bavarian Saumfermelschlag, and the group shelterwood cuttings, Schirmel or Fermelschlag. After the forest has reached maturity and full development of the trees by repeated thinnings from below, and without making large holes in the canopy which would induce natural reproduction or weeds, the removal of the mature trees begins by letting in light very gradually from the north, northeast, or, in selected spots within the compartment. In the latter case, advantage is always taken of natural openings by windthrow or other damage, for natural re-establishment has then begun. In this way the reproduction is always kept in advance of the cutting, for it is fostered by carefully regulated light both from the side and from overhead.

On the Sihlwald forest at Winterthur, Switzerland—a forest principally of spruce and fir with several hardwood compartments—both the group and the border strip methods are used. Here it is difficult to project the cutting in any particular direction because very strong winds blow from all directions. One of the problems of this forest is to develop windfirm trees. With this in view it is necessary to begin thinning from above, as well as from below, when the stand is but 15 or 20 years old. Here beech and alder are much used as nurse crops and in the improvement of poor soil. It has actually been shown that growth of an unthrifty pine forest increased materially after an underplanting of alder. Protection to plantations of spruce and fir is often obtained by interplanting of alder. When the conifers are well established and the soil much improved, the alder is cut and sold. The alder also prevents weeds from developing and interfering with the new crop. In the process of natural reproduction they sometimes clear cut in small holes, even on southerly aspects, and then plant beech or alder which will choke out the grass and weeds. When the spruce has reseeded sufficiently the hardwoods are cut. The latter are very small but can be used for various purposes. Thus, much of the slender alder goes into picture frames.

At Graffrath, in Bavaria, where both the group and the border strips are used, it is absolutely necessary, when using the border strip, to progress from northeast to southwest so as to secure shade and shelter from the drying wind and prevent damage by the storms which blow strongest from the northwest. In this manner the rate of regeneration is 4 meters per year. Naturally several parallel strips are begun simultaneously.

When using groups or spots, sometimes called the "oil spot method," the first small openings are made well inside the compartment with the purpose of enlarging these at the time of next cutting, and at the same time begin other new openings farther in. In this manner the same piece of ground is cut over three or four times and the cuttings progress in this case also from northeast to southwest. When this system is applied to a mixed stand, as of spruce, pine, and beech, the first small initial openings are made fully 10 years in advance of the second cutting in order to give the beech or other slow-growing species a chance with spruce or those which grow fast. It is, in all cases, of first importance to handle the light conditions with great discrimination so as to prevent soil deterioration and entrance of weeds or frost injury.

Where spruce and beech mix, the latter occupies the higher points of the undulating plain and the spruce, the lower swales. As soon as small openings are made in the canopy, the beech reseeds profusely. This group is then gradually enlarged in a southerly direction. Along with the beech seedlings come much grass which would choke out the beech seedlings completely unless cropped. This cropping of the grass is done by girls and women. The grass is sold for mattresses, etc. Spruce reproduces later, provided the soil is in the right condition. The spruce seedlings are not hampered by the grass. There is ordinarily difficulty in reproducing spruce on the lowest ground because it is damaged by frosts and a shelter of older trees must be retained until the spruce is one meter high.

In the Black forests on areas exemplified by the Baden and Schifferschaftwald under more favorable soil and moisture conditions than at Graffrath or Winterthur, both the groups and the border systems with natural regeneration are in general use, but there is much less need for the hardwoods as nurse crops. Spruce predominates in the softwood compartments, with here and there a sprinkling of fir—Weistanne, on north aspects and scattered pine on south slopes. They are very anxious to increase the fir in the forest, but it is difficult to reestablish naturally,

in that it does not start on raw humus. A period of 15 years must elapse before the ground is in proper condition. By this time, however, there are usually too many weeds. Another drawback is the very slow early growth of the fir compared with spruce. The solution is preparation of the soil by hacking or by planting of hardwoods.

The hardwood compartments are ordinarily regenerated by progressive border strip cuttings, but in this case there are fewer removals from the same piece of ground than in coniferous forests. Natural seeding is induced by hacking the ground. Usually people who gather fuel must prepare the ground for the seed. Under gradually opened canopy the hardwoods establish themselves first, next comes the pine, and lastly the larch. The last two species figure conspicuously in the reserve of scattered trees left over the cut areas for quality production, seeding and upkeep of the strain or stock.

Space is not permitted to discuss the various methods of hardwood regeneration in high and coppice forests. Those who labor with these species will find a trip to the Heidelberg and the Baden forests most interesting and instructive. Of particular interest are the composition, distribution of species and poorer rate of growth on the sedimentary soils of the Heidelberg forest as compared to the Baden forest. In Prussia, too, it was discovered that beech and other hardwood species improve the soil and favor natural reproduction of their ubiquitous Scotch pine, and that the growth of pine is thereby increased; but in spite of warnings and many difficulties, many cling to artificial regeneration, for it is quick and more certain than natural methods. Every student of forestry is familiar with the intensive methods of soil preparation, plowing, harrowing, drill sowing, etc., employed in the efforts to obtain new stands by artificial seeding, intermixing of soil and humus, and the experiments in the width of the clear cut strips, the heavy windfall damage and deplorable losses by insect attacks. As a result some have experimented with the Wagner border cuttings and the group shelterwood system, and in this there is some promise of success for the hardwoods reseed willingly. It is only a matter of proper regulation of light and shade. The reader will be interested in Mr. Recknagel's observations, Forestry Quarterly, Vol. II, 1913, p. 135.

In recent years Prussia has given birth to another form of forest management, the Dauerwald or continuous forest. It had its beginning at Barenthoren in 1884 in a stand of Scotch pine. Dauerwald is the highest development of systems which simulate natural processes.

The aim is continuous maintenance of good forest cover and soil quality, high yields per acre, full use of the benefits of hardwoods, and natural regeneration. In this method there is neither order, system, nor fixed rotation. The trees are cut when of a specified size, rather than of a certain age. The effort is to secure the highest possible growth on the most desirable stock, and in this it meets the commercial rather than the financial demands. Adoption of this system means abolishment of the old order of forest regulation. Cutting takes place whenever and wherever there is a silvicultural and commercial need. Much care is bestowed upon the development of individual trees, for the tree and not the stand is the unit of management.

Under this continuous system of management, the new growth is started under the protection of older trees. It develops slender stems with thin branches. When sufficient light is admitted, the saplings show rapid development. The debris from cutting is allowed to rot on the ground and no material in the form of leaves, litter, etc., is removed from the forest. Möller, who has initiated and used this system in the pine forest referred to, claims that the quality of site has improved greatly, the forest showing an increase in growth from 21 cubic feet per acre in 1884 to 47 cubic feet per acre from 1884 to 1913. The mean annual growth since 1884 is 43 cubic feet per acre. (For more complete description, see JOURNAL OF FORESTRY, Vol. 20, No. 6, p. 651.)

Thus, the story of development of silviculture systems is a repetition of the search for the Holy Grail. It was right there at the gate all the time, while the knight sought it far and wide in foreign fields. And the lesson that we foresters must learn is evident and unmistakable. The objections to the more intensive systems are damage to reproduction, frequent cuttings, and difficulty of regulation. They require an intensive road system, permanent marketing conditions and highly trained foresters. Good roads exist everywhere in Germany, and if trained foresters are lacking, these can only be supplied by actual scientific and sympathetic contact with the forest and here lies the philosopher's stone of the foresters. Clear cutting and planting of forests are reduced to mechanical routine and rule of thumb. It is only in an endeavor to secure natural establishment and in maintaining the ideal silvical condition of the forest that the forester must study all the physical, chemical, and biological factors which influence and control birth and growth, life and death in the forest.

THE PRINCIPLES OF FOREST INSURANCE

By Paul A. Herbert

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A prudent man desires to eliminate uncertainty from any business venture in which he is interested. Risk is detrimental to any economic undertaking whether or not a loss occurs. No business can give the maximum return when it is subject to uncertain losses. Man's efficiency usually increases with the reduction of uncertainty. Preventative measures reduce uncertainty but can never eliminate it. Insurance has been found to provide, if properly managed, the cheapest method of reducing uncertainty, and the only method of eliminating it entirely. Insurance is a social device for making accumulations to meet what from the individual's viewpoint are wholly uncertain economic losses, by combining and transfering many individual risks to one person or group of persons. Insurance takes for granted the existence of the uncertainty and the resultant losses.

It has been said that without fire insurance our present economic progress would have been impossible. At least we know that urban enterprise has found insurance a necessity despite efficient fire protection. No one cares to invest large sums of money at a low rate of return in a business which is subject to destruction. Forestry is such a business. The profits obtainable in the production of timber are usually not large enough to warrant the risk to the invested capital. Professional foresters do not as a rule invest their savings in the business of timber growing. More effective protection will not in most cases place forestry on a basis attractive to private capital if we judge by the experiences in other fields of endeavor. Forest insurance on the other hand will place forestry on a business basis which is the fundamental prerequisite for the practice of forestry by the private citizen.

Any form of insurance is based on the theory that combining and assuming a large number of uncertain risks transforms the resulting losses into certain and variable losses. These losses are paid by exacting a small proportionate sum from each member of the combine which will just cover the certain losses but which will allow a small margin

of safety in covering the variable losses. Competition prevents the entrepreneur from charging more than enough to pay for the certain losses. The sum collected for the variable losses, however, depends partly upon his sagacity and judgment. He must collect a margin above the average variable loss in order to compensate him for assuming this risk. This margin depends on the state of competition and the percentage of variable loss. Competition may become very keen but a margin of safety must always be paid so long as a variable loss exists. One way, then, to reduce the cost on any given group of risks is to reduce the percentage of variable loss. Variable loss can be greatly reduced by increasing the number of risks in the group or by lengthening the period of time covered by the contracts. It is usually for this very reason that large insurance companies prosper upon rates with which smaller concerns become bankrupt.

In the light of the above theory self-insurance would not pay no matter how many risks one concern has, as a combination of these risks with still other risks would lower the variable loss, and hence the cost of the insurance. However, under present conditions the certain and variable costs make up only approximately 55 per cent of the insurance premium collected by stock insurance companies. The other 45 per cent of the premium is used to pay administration costs, taxes, and profits. It is because of these latter items that many large concerns find that they can better afford the disadvantages of a large variable loss and underwrite their own risks, than pay this high overhead. The average business, however, is not large enough to assume its own losses.

Some of the larger timber land owners such as the Federal Government, the States, and some of the very largest private concerns who hold many risks so situated as not to be subject to serious conflagration hazard, will find it to their advantage, under present conditions, to use self-insurance. However, the vast majority of timberland owners either have comparatively small holdings or large blocked holdings subject to conflagration hazard, under which conditions equitable insurance is necessary before such holdings can become profitable forestry investments. Most of the private concerns growing trees do not realize a profit on them. Often such a venture is conducted in conjunction with some other business, such as a saw mill, which carries most of the overhead of the business of tree production.

There are three general types of entrepreneurs engaged in writing fire insurance in the United States today. They are the individual un-

derwriters (sometimes calling themselves American Lloyds), the mutual organizations, and the stock corporations. Individual underwriters usually have comparatively limited resources and as such cannot always be relied upon to pay losses in full in bad fire years. The amount of business written by individuals and partnerships in this country is negligible. The London Lloyds should not be confused with their American imitators, as they are a trustworthy incorporated organization of individual underwriters so organized and banded that losses are practically always paid in full. London Lloyds write vast amounts of insurance, particularly marine insurance.

The local mutual insurance companies are operated by the policy holders with perhaps only one paid official, no agents, and hence a low administration cost. The policy holders share the profits of the business in the form of reduced premiums and rebates, but they also share the losses and hence in bad fire years they may be required to pay assessments in addition to their original premiums. Formerly they were liable to the extent of their entire private fortunes, but today mutuals usually have a clause limiting the assessment liability to twice the original premium. Mutuals have been especially successful when operating over a small area, such as a county, and accepting only such risks which possess negligible conflagration and exposure hazard. Local mutuals of this character, because of the close supervision possible by policy holders, flourish in many farming comuunities. Mutuals that operate over extended areas have much larger administration costs and lose the advantage of personal interest and close supervision. They partake of the nature of stock companies without usually having the resultant advantage of strength and freedom from assessment. Factory mutuals and various kinds of industrial interinsurance organizations have usually proven successful because of the reduction in overhead, and because of the close cooperation possible between concerns engaged in the same kind of business.

The stock company is operated for profit by a number of shareholders. The policy holder pays a fixed premium and is not liable to further assessment. In years when premiums are not sufficient to pay losses the shareholders meet the losses out of the company's capital and surplus. Stock companies in this country have in recent years been very reliable. They write most of the insurance in the country today. The chief advantages of the stock companies are that they usually possess sufficient resources to write all the insurance desired and that the policy

holder is never liable for more than his fixed premium. Stock companies are generally very large and operate in such a way that a huge overhead is unavoidable. In most cases, however, this disadvantage seems to be counterbalanced by the advantages secured by the policy holder.

Which of these three general types of private insurance organizations is best suited to insure forest property? The individual underwriter and most of the mutuals, do not possess the resources necessary to underwrite successfully a business in which the individual properties are so vast. Furthermore, usually neither of these two forms of organization can successfully withstand the conflagration losses to which forests are exposed. Possibly at some future date a large forest land owners mutual may successfully undertake this business. It would have to be modeled after the industrial mutuals, in which the chief advantages are fairly low administration costs and close cooperation between policy holders. Such a company is not now feasible, and will remain a perilous undertaking, until forest land owners generally throughout the country find it possible to practice profitable forestry. Such is not now the case.

In this country there has been little agitation for government property insurance. Theoretically, governmental insurance should furnish the cheapest protection possible. In forestry this would be particularly advantageous because of the low returns and long periods covered by the investment. However, the lack of private initiative has usually made governmental enterprises financial failures. Any scheme of governmental forest insurance, then, would have to have sufficient advantages to counterbalance this inherent disadvantage of public business. A plan of governmental forest insurance (Abstracted in JOURNAL OF FORESTRY, 22:2: 236-7, February, 1924) embodying very low administration costs has been prepared by the writer. The plan calls for compulsory insurance of *all* forest land within the state with the exception of the farm woodlots. While compulsion is unpopular with the individualistic American, yet it would seem that at present any plan of governmental forest insurance based on voluntary action is doomed to failure. It is highly improbable that any plan such as suggested can be adopted in the near future. Too many questions as to constitutional and private property rights are involved.

This then leaves the field of successful forest insurance for the near future, mainly in the hands of the large stock companies because with

their size and strength they can afford to pioneer in this business and can underwrite large single risks subject to conflagrations. Two such companies, the Globe and Rutgers and the Home Insurance Company, are now writing this insurance in a limited way. Expansion both in territory covered and in the class of risks written is absolutely essential before such business will be successful from the company's point of view. From the forest owner's viewpoint rates must either be lowered or the margin of profit in forestry increased before it will be financially possible for many owners to take advantage of this protection. A careful study of existing statistics plus guarded statements by insurance officials writing this insurance, leads one to believe that rates could bear some reduction. Competition will become keener as forest insurance business increases and will tend to lower rates. But whether rates are lowered or not the demand for this coverage will increase as the price of lumber approaches the cost of growing the timber. When nature's supply of timber is exhausted and its place taken by the man-aided product, the insurance of forest properties will be as common as the insurance of other human endeavors.

THE PARTIAL COUNT METHOD OF TIMBER ESTIMATING [1]

By H. R. Wickenden

Chief Forester, Wayagamack Pulp and Paper Company, Limited.

In carrying on large exploitation operations in virgin forest it is often necessary to make extensive timber estimates with limited means and within limited time.

The estimating proper is usually accomplished by some fixed method of tallying, etc. The cost is regulated by diminishing or increasing the amount of ground upon which timber conditions and data are recorded, that is by changing the so-called per cent of estimate. The extreme reduction of the per cent of estimate to cheapen the work may necessitate the compiling of the results in lump sum figures only for whole tracts. It may consequently not be possible to segregate information on smaller areas or individual stands.

Costs could be diminished without necessarily covering less ground in cruising by using less refined estimating methods. With this idea in mind I have developed the following way of estimating timber. I have used it in cruising large areas as cheaply as possible, and have been able to secure accuracy, and detail the information of small areas to furnish various figures required in operating woodlands, as, for example, in giving out either large or small logging contracts.

The actual application of the method will be given first and the theoretic explanation will be found at the end of the article.

SOME PRINCIPLES OF ORDINARY TIMBER ESTIMATING

In ordinary timber estimating some of the basic factors required are: (1) The size of the trees; (2) The number of trees per unit area.

The usual procedure is as follows:

The size of the trees is obtained by recording (tallying) trees according to diameter. Height is also taken into consideration in nearly all methods.

[1] Paper presented before annual meeting of Canadian Society of Forest Engineers, Montreal, Jan. 22, 1924.

Having determined the number of trees found in each diameter size class, the average tree diameter may be computed.

The volume, the number of logs, and any other feature may then be obtained from available tables or curves to correspond to the above-mentioned average tree diameter. This average tree volume, etc., multiplied by the number of trees per unit area, let us say per acre, gives the wood volume, etc., per acre.

Bearing this more or less universal procedure in mind, the changes introduced by the new method outlined hereunder will be readily understood.

THE PARTIAL COUNT METHOD

The main feature of the new method is the determining of the average tree diameter. This is done while incidentally counting the number of trees on any area. They are counted in two groups—the large and the small trees. It has for this reason been called "Partial Count" method of diameter determination.

Procedure.

(1) On any area where a timber estimate is made, such as a sample plot or strip, or other area, the trees are counted in two groups. One group is for trees smaller than a certain arbitrarily chosen diameter. The other group is for trees as large or larger than the chosen diameter. This chosen diameter will hereafter be called the "Diameter Limit." No other diameter differentiation is made—a tree is classed as belonging to the smaller tree group or to the larger tree group and no other consideration is given to its diameter.

(2) The total trees on the area is the sum of these two groups.

(3) The per cent of the total trees made up by the large trees is calculated.

(4) This per cent is referred to a set of curves (or a table) showing the percentual distribution of trees of various diameters on an average diameter base (Fig. 1).

Example.

If it were required to determine the average diameter and number of trees 4 inches d. b. h. and up on a sample plot or strip, and it were noticed that most of the trees in the stand were less than say 9 inches in diameter breast high (d. b. h.):

(1) One might choose 9 inches as arbitrary diameter limit. The trees less than 9 inches d. b. h. would be counted with an automatic tally machine. The trees 9 inches and up would also be counted, preferably by making a mark on a piece of paper as each large tree occurred; i. e., making a running tally.

We would thus determine how many trees were greater than 9 inches and how many trees were less than 9 inches. We would not pay attention to actual diameters except in some few instances to determine if a tree was full 9 inches or short of 9 inches d. b. h.

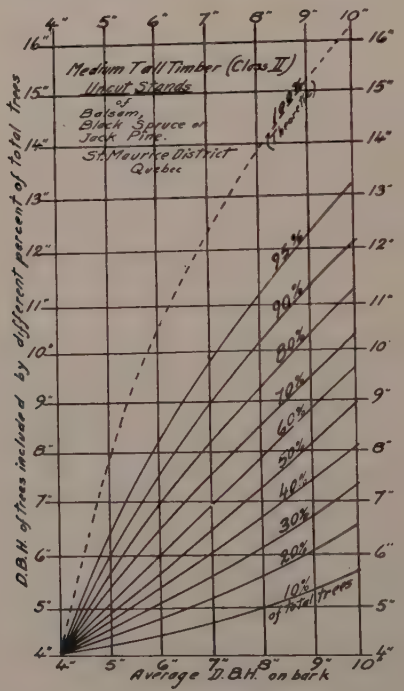


FIG. 1.

(2) We would then have two groups of, let us say, 109 trees less than 9 inches d. b. h. and 14 trees 9 inches d. b. h. or larger. This gives: Total trees, $109 + 14 = 123$ trees; or, $123 = 100$ per cent of the trees.

(3) The trees 9 inches and up in d. b. h. $= 14/123$ of the total trees; that is, 11.4 per cent of total trees.

(4) Referring to Fig. 1 we find that when 11.4 per cent of the trees are

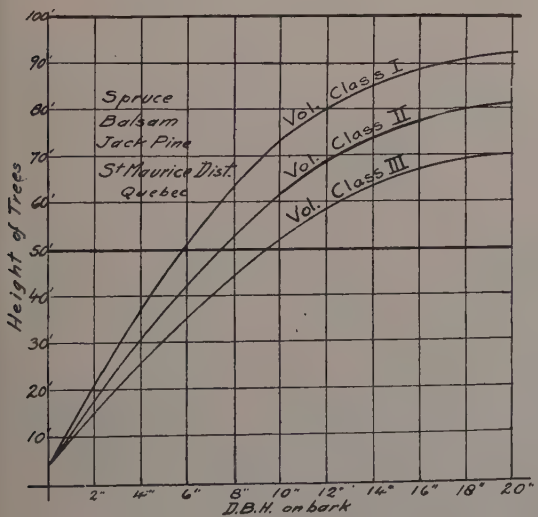
greater than 9 inches d. b. h., or vice versa, that 88.6 per cent of the trees are less than 9 inches, the average tree is 7.1 inches d. b. h.

(5) Referring to the local tables or curves one could determine the volume, size of logs, etc., as required, corresponding to a 7.1-inch tree. Multiplying these results by total number of trees would give the total quantities.

EXAMPLE OF WORK DONE IN THE FIELD

In a two-man party the procedure is as follows:

One man makes a map of the timber types, topography, etc.; the second man follows and records with a counting machine all trees under a certain diameter. He tallies down the trees above this diameter, having previously chosen a diameter limit which will insure his not having to tally more than say one tree out of ten. Whenever the stand changes or a different diameter limit is to be used the counter puts down his results and chainage for the stand just past, and begins anew. (Of course, if one were desirous of obtaining details for each stand, one could simply continue the counting as far as one liked.) The stands are usually classified ocularly into types of tall, medium and short forest. This takes care of the height variation mentioned above to a sufficient degree of accuracy.



VOLUME CLASS			
D.B.H.	I.	II.	III.
	Volume in Cubic Feet		
4"	2.93	2.26	1.62
5"	7.06	5.68	4.48
6"	14.16	11.37	9.57
7"	24.54	20.41	18.50
8"	35.73	31.78	29.00
9"	45.20	45.13	41.56
10"	67.38	60.46	55.86

FIG 2.

After the day's work is done the counter puts down his results on a suitable form and works out the total number of trees found and determines the percentage above the chosen diameter limit. This is referred to a curve or table, as shown above, and the average diameter is put down.[2]

This average diameter is referred to tables which give average number of logs per tree for such a diameter and the average log corresponding to such a tree diameter.

Remarks on the Selection of a Diameter Limit.

The diameter limit is chosen in each type of timber to suit the estimator's convenience, and so that it can be referred to some reliable portions of the curve: Fig. 1. The curves (Fig. 1) are, however, still readable with accuracy in the neighborhood of the 90 per cent line. The estimator will naturally try to simplify his counting and marking. If, as we now do in practice, the estimator chooses a diameter limit which is high enough he will have few big trees to tally, and have most of the trees coming under the diameter limit and counted on the automatic tally register. (In the above example 109 trees out of 123.)

Most of his work may thus be straight counting of trees, yet he can refer his data to the curve and get the average diameter with fair accuracy.

SIMPLIFYING THE FINAL COMPUTATIONS

In carrying on cruising I have still further simplified the computation of field data by using curves and tables which relate volume, logs, etc., to some known factor, such as average diameter.

The different computations are treated as follows:

Volume.

Local volume tables or curves referred to diameter alone are used. One table is used for "tall" timber, another for "medium" timber, and the other for "short" timber. These tables have been previously prepared or have been picked out of the general form quotient table,

[2] When one stand is crossed by several strips on which the average diameters are slightly different the final averaging up of the diameters is done by entering on the recapitulation of the estimating done in that stand the total trees counted on each strip (n) and the product of this number of trees multiplied by the square of the average diameter found ($n \times d^2$). The total of all trees counted for the different strips is then made (1) and the total of the above-mentioned ($n \times d^2$) factor is made (2). The grand average tree is then determined by dividing (2) by (1) and taking the square root of the result.

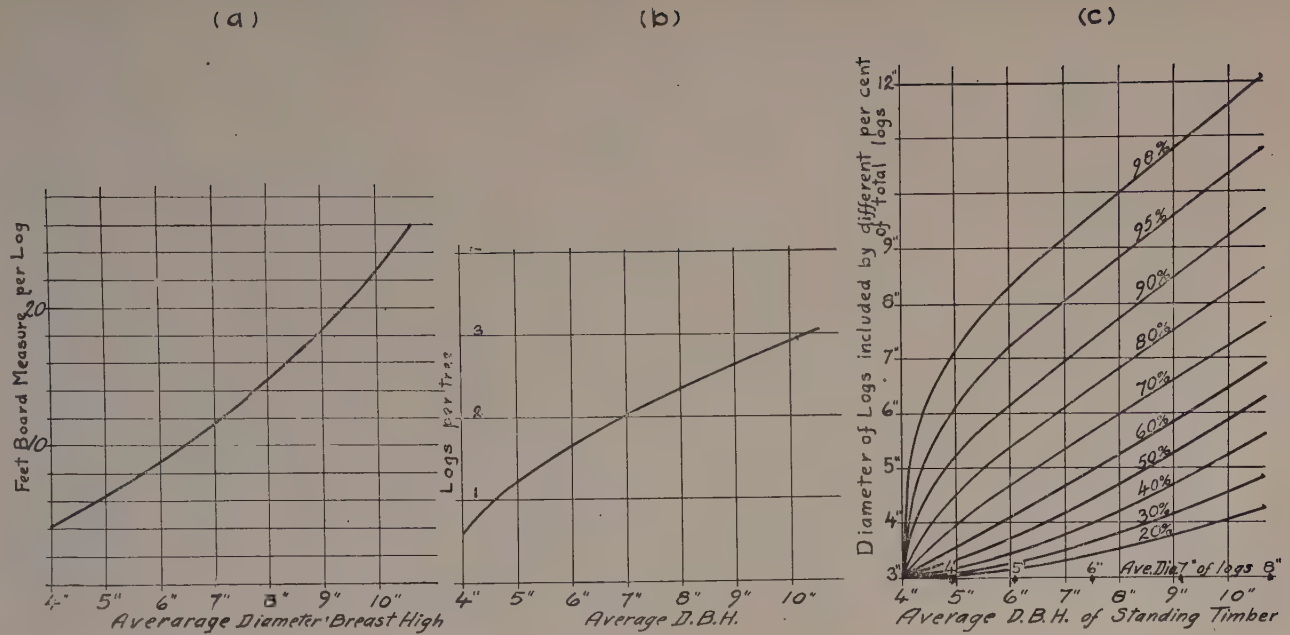

(a)
(b)
(c)
Feet Board Measure per Log
10
20
4" 5" 6" 7" 8" 9" 10"
Averarage Diameter Breast High
Logs per tree
1
2
3
4" 5" 6" 7" 8" 9" 10"
Average D.B.H.
Diameter of Logs included by different per cent of total logs
3"
4"
5"
6"
7"
8"
9"
12"
98%
95%
90%
80%
70%
60%
50%
40%
30%
20%
4" 5" 6" 7" 8" 9" 10"
Ave. Dia. 7" of logs 8"
Average D.B.H. of Standing Timber

FIG. 3.

using a diameter height and form as arguments. (See article in the October, 1921, JOURNAL OF FORESTRY.[3]) Each stand is referred to its proper table according to its relative height. Figure 2 shows how the stand is ascribed to its volume table by referring to height curves showing what is meant by short, average, or tall timber. This judging of tall, medium or short timber is entirely ocular, but may be checked occasionally by measuring the height of a few trees—or even windfalls—and referring to curves.[4] As the man's judgment becomes trained in this respect, less checking up is necessary.

Logs.

The size of the logs depends on the size of the timber cut: hence the use of the curve (a), Fig. 3.

The number of logs per tree is also dependent on the size of the timber. See curve (b), Fig. 3.

Having determined average diameter, one refers to each of these curves obtaining the number of logs per tree (which multiplied by the total trees gives total logs) and the average log in f. b. m. (which multiplied by total logs gives total f. b. m.).

Distribution of Logs in Different Dimensions.

Fig. 3 shows how the proportion of logs of different sizes will vary according to the average trees of the different stands (or according to the average log of the logs measured: This implies the same things, since average log depends on average tree).

This information may be used when, for example, the proportion of small and large logs is desired for price making.

NOTES ON THE APPLICATION OF THE PARTIAL COUNT METHOD

The ordinary curves should only be used for a homogenous community of trees. This is the usual condition. Exceptions are found, for example, in a two-story stand. In such a case the two stories are segregated and treated as usual. Another exception might be the case

[3] The Jonson Absolute Form Quotient: How it is Used in Timber Estimating.

[4] A further correction may be applied after comparing the actual height of a few trees in any stand to the height curve to be used. If it is found that the timber is say 10 per cent greater than shown on this height curve the number of logs will be increased by 10 per cent. Likewise, the size of the logs board foot or cubic contents will be greater—about 1 per cent increase in volume of logs for every 5 per cent increase in height of trees.

of partly cut-over forest, which might necessitate a special curve similar to Fig. 1.

The system may be used by inexperienced men, especially in ordinary uniform forest. A trained forester's attention would be required only in exceptional cases as mentioned above.

One advantage of the method is that the man recording the data needs only to measure one size of trees. If, for instance, he chooses 10 inches as his diameter limit in a certain stand, he will only caliper, or train his eye to estimate, 10-inch trees.

In any stand there are relatively few trees having any one particular diameter (especially if this chosen diameter is that of larger trees, which, of course, are not numerous). It is consequently seldom necessary to measure a tree to determine if it is either as big as, or smaller than the diameter limit selected; in the above example, 10 inches.

This is much easier than ordinary tallying, where all sizes have to be measured or estimated by eye; yet, determination of average diameter is as satisfactory for the requirements of ordinary exploitation.

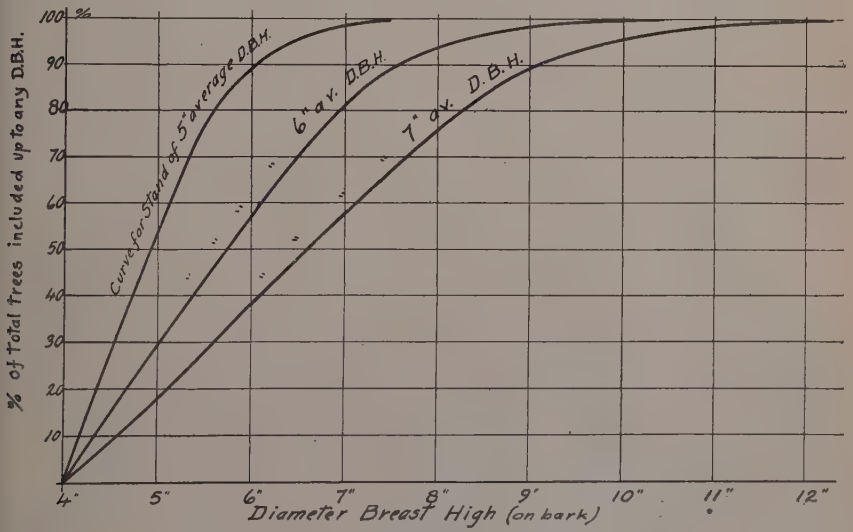


FIG. 4.

THEORY AND CONSTRUCTION OF THE PARTIAL COUNT METHOD

In natural phenomena or growths of the same sort, the relative number of cases found of different dimensions follow the law of probability and formation of averages.

In the forest one finds large, average and small trees. The proportionate number of the trees of various relative sizes follows a general law. If, for example, one plots the per cent of trees found in one stand included up to any diameter as ordinates and the diameters as abscissa one obtains curves as shown on Fig. 4.

Larger or smaller timber causes a shifting of the curve to the left or to the right respectively, as shown above.

The curve applying to any one stand is thus dependent on its average diameter. Determining any one point on a curve fixes the whole curve, and hence determines average diameter.

The construction of a set of curves can be made from data gathered in many different stands—as far as possible, stands of large timber, stands of medium timber, and of small timber.

Fig. 1 is a more convenient representation of a curve series shown in Fig. 4. The curves from many stands having been plotted on the one chart and evened out to give the final result, Fig. 1.[5]

In dealing with partly cut-over areas special curves should be prepared for that particular type of timber stand. Thus, for instance, a certain diameter limit cutting system has been applied in Quebec Province. The partly cut over areas consequently show certain characteristic conditions. A "cut-over forest" curve is used satisfactorily. (This curve having been constructed in the same way as the above, using data gathered in "cut-over areas.")

PARTIAL COUNT FOR LOG SCALING

An interesting application of the partial count system is in the scaling or check scaling of logs.

In any regular lot of logs it is found that the proportion of logs of different sizes seems to follow a regular progression, just as in the above-mentioned case of standing timber. This proportion is also dependent on the "average" diameter of the logs, or of the trees from which the logs are made. See Fig. 3-c.

Logs may be scaled by the partial count method as follows:

[5] It may be found that there are two general types of curves—one for trees in uniform stands, as for example pure conifer even-aged stands, and one for trees growing more at random and in great variety of sizes, as for example sparse white spruce in mixed hardwood stands. In ordinary work the differentiation between these two types of curves seems like an unnecessary refinement and need not be considered except where greater precision is required. We are getting satisfactory results using the pure conifer curve in practically all cases.

(1) *a*. Count the logs as great or greater than a certain arbitrarily chosen diameter. *b*. Count the logs less than this diameter.

(2) Using the specially prepared size distribution and average diameter curve (Fig. 3-c), determine the average diameter.

(3) The volume in board feet or other units corresponding to such a log diameter multiplied by the total number of logs gives the total volume.

If the absolute cubic foot content of logs were required, one would have to determine their average diameter—their middle diameter (nearly). For total quantities, the average *middle diameter* and total number of logs would be required.

In dealing with logs of uniform length these two factors can be obtained by counting the number of diameters both larger and smaller than an arbitrary diameter limit *at both ends of the rollway of logs*. The sum of these two numbers is the number of *log ends* or twice the number of logs in the rollway. The number of large diameters can then be expressed in per cent of the total diameters. Referring this percentual expression to the size distribution curve (Fig. 3-c), one determines the average middle diameter of the logs.

The average true volume per log is the volume of a cylinder having the above-mentioned average middle diameter and the length of the logs.

This average true volume multiplied by the number of logs gives the true total cubic volume of the logs.[6]

In ordinary scaling it is common, though poor, practice to apply the measure to some logs and to estimate by eye the diameters of a great portion of the logs.

This may cause some error, because accurate results depend on accurate determination of the diameters of all the logs.

Whatever other inaccuracies may result by its use, the partial count method at least does away with this difficulty, as the "diameter limit" is the only diameter measurement required.

[6] There is a mistaken notion frequently implied as regards the adoption of the cubic foot unit instead of the old board foot rules. Without going into the merits of the respective units it must be borne in mind that so long as we must measure logs at one end, any volume table used whether in cubic foot units or in board foot units will not be exact in all cases for any great region having different types of forest. Each cubic foot or board foot based on the diameter at one end of the logs (the small end) assumes a fixed rate of taper. But rate of taper varies in different tracts. This difficulty is felt in Europe—a cubic foot according to one log table may not correspond to a cubic foot according to a log table of a different tract. It must also be noted that a cubic foot of wood in standing timber, a cubic foot of wood in logs, and a cubic foot of sawn wood are different things.

As the whole system is based on averages, it is necessary to deal with large quantities in order to ensure getting accurate results. The greater the quantities the better the average. I would consider a lot of say 10,000 logs or more as liable to give accurate results, although it will often be the case with fewer logs.

CONCLUSIONS

The partial count system is a method of determining average diameter, especially in ordinary normal timber conditions. The accuracy obtained satisfies the requirements of present day forest operations. It reduces the field work materially, especially when using automatic tally registers.

It is convenient for one-man reconnaissance work. It permits one to move over the ground fairly rapidly while also recording the size of the timber.

The field records are so simple to keep that the work may be done in normal cases by men having no technical training.

The use of many local auxiliary curves and tables based on average diameter, etc., also reduce the work of computation.

The method may be used also in scaling logs when dealing with large quantities and furnishes an easy means of determining true cubic volume of logs.

CONSISTENT ACCURACY IN SAMPLE PLOT COMPUTATIONS

By Ferdinand W. Haasis

Appalachian Forest Experiment Station.

In a certain one-eighth acre sample plot the diameter at breast height of each tree was measured with the tape to the nearest one-tenth inch. The number of trees on the plot was, of course, known and so the number of trees per acre could be determined (within very slight limits of error). The average height corresponding to each inch class of diameter was determined. From these data and a form factor of 0.5 the cubic foot volume per acre was computed, the diameters being grouped into inch classes for convenience in computation. The result was 993 cubic feet.

Check computations were also made for each one-tenth inch class, the corresponding heights being interpolated. The result was 998 cubic feet per acre.

The average diameter of all the trees on the plot was determined to be 3.6 inches (to the nearest one-tenth inch). Using the interpolated height corresponding to this diameter, the volume per acre was computed as 979 cubic feet. We have, then, three values for this volume, computed by three methods involving very different amounts of work. Let us see how they compare:

	Volume in cubic feet per acre		
	To nearest cubic foot	To nearest 10 cubic feet	To nearest 100 cubic feet
Based on d. b. h. for each one-tenth inch class	988	990	1,000
Based on d. b. h. for each inch class	993	990	1,000
Based on average d. b. h.	979	980	1,000

Evidently there is a chance for error here in grouping the diameters by inch classes. The 4-inch class, for instance, may, according to a common method of computing, include diameters ranging from 3.5 inches to 4.5 inches. The area in square feet of a circle 3.5 inches in

diameter is (to the third decimal place) 0.067, of a 4.5 inch circle 0.111, and of a 4.0 inch circle 0.087; that is, there is a possibility that the average basal area in this inch class will be as much as 23 per cent less than that for 4 inches or as much as 28 per cent greater.

Even for the one-tenth inch classes, however, we are not absolutely certain of our figures. The 3.6 inch class, for example, includes trees running from 3.55 inches to 3.65 inches in diameter. The variations in basal area corresponding to these two values from that for 3.6 inches are, respectively, plus and minus 3 per cent. It seems unlikely that we can increase the accuracy of our field measurements to one-one hundredth of an inch in tree diameters and we must therefore resign ourselves to the possibility of errors from this source.

No computation of the possible range for total volume was made which took into consideration the one-one hundredth inch classes. For the 56 trees per acre of the 3.6 inch class, however, the possible limiting values are 66 cubic feet and 70 cubic feet. It will be observed that the difference between these two values is very nearly as great as that between the inch class and the one-tenth inch class values based on the entire 808 trees per acre.

Now, where is all this leading us to? Briefly, to this: *How much refinement is justified in our mathematical work?* The above calculations were all carried to the third decimal place up to the final rounding off to cubic feet. By "abridged" methods of multiplication the value based on the average d. b. h. is, to the nearest 10 cubic feet, 980, as above, and so, to the nearest 100 cubic feet, the same as that based on the one-tenth inch classes. As we have seen, however, the inaccuracy of field measurements introduces an uncertainty into even this latter value. The inch class value agrees to the nearest 10 cubic feet with the one-tenth inch class value. But the inch class computations are subject to errors of, in some cases, over 20 per cent. On the other hand, the value based on average d. b. h. may also vary within comparatively wide limits.

There are a few other possible sources of error which are probably negligible, for instance, the arbitrary limiting of the square foot basal area to the third decimal place, and trees not wholly within the plot boundaries. On the other hand, it is to be noted that with an increasing number of measurements the chances for *compensating errors* are correspondingly increased.

This is an isolated case selected at random to illustrate the principle

involved. Additional comparisons could readily be made for other plots. The point is: should we not establish a limit of reasonable accuracy in computations, accuracy of a degree to correspond with that of our data, say within the nearest 10 cubic feet or 100 cubic feet, for instance, of the actual value and then eliminate the great bulk of our computations after this fashion:

Given:	average d. b. h.	3.6	inches
	number of trees per acre	808	
	height corresponding to d. b. h.	34	feet
	form factor	0.5	
	basal area corresponding to d. b. h.	0.071	square feet

Then, using abridged multiplication:

808	574
17	43
566	172
8	23
574, or 57.4 square feet	195, or 1,950 cubic feet

$1{,}950 \times 0.5 = 975$,
or 980 cubic feet per acre, or 1,000 cubic feet per acre.

Do our field methods justify any greater degree of refinement in office computations?

A STEP TOWARD UNIFICATION OF YIELD STUDIES

The following two reports on growth were reported out by committees appointed for this purpose at a conference of the research men of the Forest Service held in Madison, Wisconsin, from March 10 to 22. These reports appear to be so important, in view of the thought and attention that are now given to growth and yield studies in this country, that they are given for the benefit of those who may be interested in this subject. Perhaps the biggest problem confronting foresters having to do with yield studies at the present time is that of degree of stocking or the recognition of normality. This has not been done either in this country or abroad on a scale that would render it possible to apply the growth to uneven-aged stands we are obtaining under our American conditions.

Report of Committee on Growth of Uneven-Aged Stands

Growth of uneven-aged stands should be studied by means of permanent sample plots wherever possible. Yield tables for even-aged stands may readily be built without permanent plots, but some of these should be established in all regions to study the development of such stands.

When it is necessary to predict future growth in uneven-aged or cut-over stands the method used must be determined by the stocking of the stand on the ground. When cut-over stands contain less than 10 per cent of normal stocking it is preferable to place emphasis on the new growth and to predict its future as an even-aged stand, rather than attempting to prognosticate the future of the older trees left.

For typical uneven-aged or selection forests containing normal numbers of mature trees the net change in volume from year to year is nil. Therefore attention should be directed to immature or understocked or cut-over stands.

In immature selection forests the yield of the near future may be prognosticated on the basis of the diameter growth rate of the dominant portion of the stand.

In understocked or cut-over stands whose present stocking is 10 per cent or more of full stocking two methods of approach are suggested, both of which imply a knowledge of the rate of growth of trees in

similarly understocked stands. The first method involves the study of the rate of diameter growth of trees of given diameter classes or other limited groups, and the direct application of such growth rates to stand tables for the area to be prognosticated. Thus it may be stated that 10-inch, 12-inch, 14-inch, etc., trees will become 11-inch, 13-inch, and 15-inch trees in a given number of years. The corresponding changes in height should, of course, be taken into consideration.

The alternative method is to apply the cubic foot increment of similarly stocked stands, with corrections for normal mortality, to the volumes of existing stands. No attempt is made to prognosticate closely the rates of growth of trees of different sizes, the assumption being that these will be much more variable, and will change more definitely as the understocked stand closes up, than will the total increment per acre. The latter, however, in case long periods are considered, will tend to work back toward the increment rate of fully stocked stands which should, therefore, be known as a guide. In attempting under this method to estimate the future cut, it is only necessary to know the approximate sizes of the largest trees which will then be available, and in which the total net increment for the period, or any part of it, may be harvested.

For either of the above methods of computing future growth, the basic data needed may be obtained from permanent sample plots in cut-over areas, or from temporary plots in which the rates of growth are determined either by increment borings or stem analyses covering the period since cutting was done. The method of stem analyses promises greatest accuracy in the matter of volume increments. Such plots, or more extensive areas, may also serve to give the information on normal mortality in such stands.

C. G. Bates,
R. H. Weidman,
G. A. Pearson,
E. H. Frothingham.

Report of the Committee on the Type and Use of Yield Tables

I.—Importance of Building Up a Series of Reliable Yield Tabels for the Entire Country

The discussion at the conference has brought out strikingly the dearth of satisfactory yield tables, yet the need for such tables is very

apparent. It is urged that means be taken to build up as fast as possible a series of yield tables covering the principal even-aged forest types of the country, these tables to be correlated to an accepted site classification, and to cover both National Forest and private forest conditions.

II.—Definition of Even-Aged Stands

The forest growth considered in this report includes stands containing less than 10 per cent of normal stocking in addition to those stands which have started within the period of a normal age class.

Heavy cutting of the original forest will result in stands essentially even-aged. The exceptions to this are stands which have little merchantable timber or which have so definite an all-aged character that partial cutting is most practical.

III.—Definition of Empirical and Normal Yield Tables

Chapman's Forest Mensuration, pp. 395-397, gives definitions of empirical and normal yield tables, which concept is agreed to by this Committee. We wish particularly to emphasize that what we conceive to be normal or index yield tables for American conditions will show the growth that may be expected from present well-stocked immature stands. They will not necessarily indicate the full potential productive capacity of the land as European tables do for planted and thinned stands.

IV.—Major Uses of Tables Such as May Be Prepared

1. To determine best rotation age for management purposes.
2. To determine permanent sustained annual yield for long time prediction.
3. To have data for private owners as to the probable yields from practicing forestry.
4. To make scientific comparison of regions, sites, and species.
5. For short-term prediction of the immediate yields from existing immature stands.
6. For appraising immature timber.

V.—The Application of Yield Tables—Both Normal and Empirical

Considering the above uses of yield tables, normal tables only are suitable for uses 1, 2, and 4, but may be used with proper correction factors very readily for uses 3, 5, and 6. Empirical tables are adapted

only to uses 3, 5, and 6 and then only on the specific tract for which they are made. Empirical tables are "experience tables" and are not based on the laws governing natural conditions, but on the assumption that the stand, which will mature in the future on a certain area will be a duplicate of stands which have developed in the past. By their very definition they are proper only for local and short time prediction and therefore have no use in research mensuration.

All tables which are made hereafter by the Forest Service should conform to the above conception of normal tables, except when a table for immediate and local use is needed for a tract for which no normal table is available, in which case the making of a so-called empirical table is justified.

VI.—Broad Plan for Making Yield Tables

It is the feeling of the Committee that the preparation of all *normal* yield tables should be strictly a function of research, at least to the extent of specifying standards, methods and procedure, and correlating results, and ordinarily to the full extent of doing the field and office work. The preparation of *empirical* tables may or may not be done by the administrative organization; it may often be convenient to do it in conjunction with timber surveys.

It should also be the function of research to make office and field investigations looking to the perfection and standardization of methods of making normal yield tables.

The details of yield table construction are being considered by the Committee on Standardization of Yield Tables. We wish to suggest that the method of selecting plots described by Chapman (Forest Mensuration, p. 397) fits in with our concept of normal tables. We also feel that plots measured for yield tables will ordinarily be temporary but we urge that when convenient such plots be marked and described so that they might be found a decade hence. We also emphasize the need of a "skeleton system" of permanent plots as a means of checking and supplementing yield tables.

VII.—Site Classification

This Committee is in agreement that total height should be made the basis of site classification, in accordance with the general recommendation of Sparhawk's committee. We urge that the Committee on Yield Table Standards, in conference with the Branch of Research,

prepare standards for the age basis of height measurements for purposes of site classification, a standard number of sites and their unit basis for difference, and a system of co-ordination between regions. The same agencies should decide upon the policy of subclassifying sites according to mixtures of species, etc.

VIII.—Determination of Correction Factor With Which to Apply Normal Tables to Actual Conditions

As is generally recognized, in applying normal tables to *existing* immature stands a correction factor must be introduced to allow for abnormal gaps in the stocking and to allow for differences between full scale and probable actual utilization. These correction factors will usually be obtained and applied by the administrative organization or the one making the management plan or the growth prediction. But it is entirely proper and often advisable for the research organization to determine these reduction factors at the time the growth study is being made. Thus the collection of empirical data would go hand in hand with normal yield table preparation. Such correction factors are of greatest dependence and greatest need only in stands which are approaching maturity.

We consider it important that all normal tables show the basis that defines their normality for each age and site whether it be range in number of dominant and codominant trees per acre, basal area or volume, that it will be possible for the administrative forester to determine the departure of the actual stands he has from the normal, and to apply the right correction factor.

Thornton T. Munger, *Chairman*
E. F. McCarthy
Willard R. Hines
Elers Koch
Duncan Dunning
C. E. Behre

COMPARISON OF TAPE AND CALIPER MEASUREMENTS

By Herman Krauch

In the detailed studies of the rate of growth of trees on permanent sample plots, the trees are periodically remeasured at intervals of 5 years. It is essential that the measurements taken should be accurate and give consistent results. In measuring the diameters of trees either a tape or calipers may be used. As the tape covers the total circumference of the tree bole it actually measures the total growth regardless of whether this growth has been uniformly put on or not. The calipers indicate the diameter between only two points on the tree bole at a time and the measurements may, therefore, not indicate the true growth at all. It is therefore obvious that the diameter tape should always be used where absolute accuracy is desired. But because of the slow progress that can be made with the tape as compared with the caliper, its use may not be warranted where a large number of trees are to be measured.

It was for the purpose of determining the degree of accuracy of calipers as compared with tape measurements that a study was recently conducted in connection with the remeasurement of some sample plots on the Coconino National Forest in Arizona. These plots consist of two kinds, designated as "extensive" and "intensive." The extensive plots are each 160 acres in size. Within these are the intensive plots which range from 1 to 5 acres and which total about 17 acres in each case. The intensive plots were established for the purpose of making detailed studies on the rate of growth of individual trees. The diameters are, therefore, measured with a tape. The extensive plots were established for the purpose of getting a rough check of growth on an acreage basis. The diameter measurements are not intended to be as accurate as those taken on trees of the intensive plots and calipers are, therefore, used instead of a tape. But in order to obtain as accurate results as possible two measurements, at right angles to each other, are taken.

Table 1 shows the diameters of trees on the intensive plots, as measured with both tape and calipers.

TABLE 1.—*Comparison Taken by Tape and Caliper Measurements.*

Diameter class	Small plots		Large plots	
	Difference	Number trees	Difference	Number trees
Inches	*Inches*		*Inches*	
4	—.01	7	—.01	35
5	—.06	7	+.03	46
6	—.01	7	+.02	51
7	+.11	11	+.03	57
8	—.05	9	+.01	66
9	+.10	14	+.06	69
10	+.10	6	+.04	78
19	+.15	3	+.09	43
20	+.17	1	+.14	33
21	—.24	3	+.06	35
22	+.17	2	—.03	35
23	+.08	3	+.05	31
24	—.03	2	+.11	26
25	—.09	3	+.10	27
29	—.15	1	—.01	47
30	+.08	4	+.10	84

It will be noted that the data in the left half of the table are based on very few trees, whereas in the right half of the table they are based on 24 to 84 trees for each diameter class. The two compilations were made to show the effect of number of tree measurements on differences in results. But so far as the purpose of this investigation is concerned, the results given in the right half of the table alone need to be considered, for even these are based on only a small fraction of the number of trees on the extensive plots.

The results of this investigation show that the differences between caliper and tape measurements are very small. In general, tape measurements run a little higher than caliper measurements. The exceptions are due to the presence of a few trees with abnormally irregular boles on which the caliper measurements were evidently taken at the wrong points. But on the whole the calipers give very satisfactory results, and their continued use is therefore justified. It should be remembered that the calipers must be kept perfectly adjusted and successive measurements must always be taken at the same points if satisfactory and consistently reliable results are to be secured.

Comment on Tapes and Calipers

By E. F. McCarthy

When a large number of trees are measured either tape or calipers will give sufficiently accurate results with the advantage of speed on the side of the calipers.

The real fault appears in two successive measurements of the same tree by different men after the lapse of one year. Tape errors are due to:

1. Misjudging the points of measurement as little as 1 inch in height.
2. Use of wide tape and failure to place the tape in its proper plane.
3. Proximity of knots, etc. (one does not see the entire circumference).
4. Difference in tension on scaly or brittle barked trees (charred scales particularly).
5. Reading the hundredths place as tenths.
6. Weathering and scaling of bark.

The calipers are more liable to be accurately used with reasonable care because:

1. The points of bearing are always in sight.
2. The closure will crush all friable or flexible scales.
3. The scale is less liable to be misread.

Two caliper readings at right angles can be taken in about the same time as a single tape reading on trees 18 inches and over.

GLIMPSES OF ECONOMIC TREES AND PLANTS OF CHINA

By C. A. Reed

Pomologist, Bureau of Plant Industry.

So great is the need due to the density of her population and so limited her means of distribution of her products that it would not be far wrong to put all plants of North China into one group, namely, an economic group. In such provinces as Shantung, where the population is in the neighborhood of 600 to the square mile, with the exception of labor practically everything is economized. Every part of the cultivated plants is utilized in one or more ways. China is commonly regarded as being a treeless country, yet the city streets and their various compounds are adorned with such species as Whaishu (*Sophora japonica*), German acacias, willows, catalpas, poplars, gingkos, jujubes, persimmons, pines of various species, cedars, arborvitae, pistache, and even oaks, and other genera more or less familiar in this country. Not infrequently, large areas of housetops are hidden from view by foliage in the cities and towns.

China is practically virgin so far as factory coal smoke is concerned, and, incidentally, there are no forest fires. Factories are few in number and located mainly in the larger cities. All brush of the mountains is used either in the manufacture of wicker ware or for fuel, or other purpose. The sour fruits of the low growing jujube are gathered for wood and the spiny branches used for obstructions either as simple fences or barricades on the tops of walls. For fuel, all lower branches of non-fruit producing trees are cut and the trunks of trees having scaly bark are pared as closely as possible without serious injury. Field crops, such as corn, sorghum, soy beans, millet, etc., are either pulled up by the roots at harvest time or cut in the usual way and later the roots are taken up and used for fuel. Apparently the soy bean nodules on the roots are mainly responsible for the fertility of the soil.

Planted trees along railroad lines, about family cemeteries, or elsewhere in the landscape form some of the most familiar sights throughoue the plains sections of northeast China. Perhaps the most graceful in appearance are the various species of willow: the basket willow, with

its side branches removed well up to near the tops of the trees, bears striking resemblance to the American elm. Probably the most highly prized species of tree is that of the white-barked pine (*Pinus bungeana*) which, when dormant, greatly resembles the American sycamore and the oriental plane. This species is claimed to be exceedingly difficult to propagate and of slow growth, yet exceedingly long-lived. For these reasons, it was a great favorite with royalty of at least one dynasty, the Ming. Wherever members of that family established themselves, avenues of these trees were sure to have been planted. Single specimen trees and occasional avenues still remain, and in one case a forest of several acres extent it still to be seen, although from 300 to 500 years have elapsed since they were planted and in spite of the fact that the succeeding dynasty, the Manchu, apparently sought literally to uproot the trees as well as figuratively to uproot everything else pertaining to the Ming.

Among fruit producing trees, North China has a great range of species and varieties. Of these, in probable order of excellence, there are the persimmon, pear, jujube, or Chinese date as it is called, and the hawthorne. Of chestnuts, there is an equally choice range of strains. The same might be true of walnuts if the product were allowed to properly ripen before being harvested. The native apples are of low order; they could doubtless be improved upon by crossing with the wild types of lower New England. Certainly it would make the quality no worse. Some of the peaches are very fine and can well. The Bartlett pear was introduced from America some 50 years ago by John L. Nevius, a Presbyterian missionary at Chefoo, who is also credited with having introduced many other American fruits. There is said to be a highly developed fruit industry on the north side of Shantung peninsula in the neighborhood of Chefoo. Bartlett pears from that section were common on the hotel tables from Peking south to Shantung, throughout what seemed to be a long season. The Concord grapes lead American varieties in extent of planting and in some sections they are of large importance. Other American products successfully established in China are the peanut, the sweet potato, Indian corn, and no doubt many others might be mentioned. Most American vegetables and fruits have their counterparts in China.

CHESTNUT WOOD IN THE TANNING INDUSTRY[1]

By Robert W. Griffith

Sales Manager, Extract Department, Champion Fiber Co., Canton, N. C.

When Longfellow wrote his beautiful poem, "The Village Blacksmith," he was probably inspired by the chestnut tree when he described the homely virtues and manly character of the blacksmith, whose smithy was under the spreading chestnut tree.

In Longfellow's day, the chestnut tree was useful as a means of shade and as the source of a delectable fruit, but since that time the march of industrial progress has witnessed the growth of many industries in the shade of the chestnut tree. As a source of lumber, it finds an increasing use in all kinds of construction work. The chestnut tree occupies a unique place in the scheme of forestry. The fruit of the chestnut tree furnishes food; the tannin in its wood makes excellent leather; the wood itself, when properly prepared, furnishes raw material in the making of paper, and with a great deal less preparation, the chestnut tree furnishes telegraph poles, railroad ties, and in general serves a variety of useful purposes.

My present purpose is to deal with the chestnut tree from the point of view of its utility in the making of leather.

It should be noted that it is the wood of the chestnut tree, as distinct from the bark, which is the most desirable as a source of tannin. Tannin exists throughout the vegetable kingdom and there are commercial sources of tannin to be found in roots, barks, wood, fruits and leaves. There are only two woods which are at present commercially available as a source of tannin. One is chestnut wood, which flourishes so abundantly in the southern Appalachian region, and the other is the quebracho wood of the Argentine plains.

The tannin content of chestnut wood is not high enough to permit its use in the tannery direct, and in order to make it available for use in the tannery, it is necessary that the water solution obtained by cooking the wood, after chipping and shredding into the finest pos-

[1] Read before the Southern Appalachian Section, Society of American Foresters, Asheville, N. C., February 2, 1924.

sible particles, should be concentrated into thick extract by means of vacuum pans.

Chestnut wood extract was first introduced to the tanning industry in France in the latter part of the nineteenth century, and this was made possible by the use of vacuum pans, which up to the time had been used chiefly in the manufacture of sugar. The manufacture of tanning extract from chestnut wood brought a new material to the tanner and solved the problem of obtaining for the tanner a material possessing tannin in concentrated form, which presented many economies, both in the preparation of the material and in the loss of valuable tannin matters, resulting from inefficient methods of extraction in the tannery.

There are very large stands of chestnut timber in France and Italy and tanning extract made from chestnut wood had been in use for many years in Europe before the attention of the American tanner was attracted to it.

Tannin is a generic term given to vegetable matter which has the property of rendering gelatin insoluble, but the tannins of commerce possess different characteristics which impart certain qualities to leather peculiar to the material from which the tannin is obtained, and the art of the tanner consists in blending different tanning materials so as to produce the required character in the leather.

Vegetable tannins are divided into two main classes; one known as the pyrogalol and the other the catechol type. The pyrogalol type of tannins yield heavy insoluble material in their solution and chestnut wood tannin belongs to this class. In practical tanning, the use of chestnut wood tannin is almost entirely confined to the production of heavy leathers, such as sole, belting and harness. To these leathers, chestnut wood tannin imparts solidity, firmness, and tensile strength. Approximately 50 per cent of all tanning material used in the production of heavy leather is chestnut wood extract.

Although the outline of the process for the manufacture of chestnut wood extract is comparatively simple and may be briefly described as consisting in chipping the chestnut wood into small particles and digesting the wood with hot water until nearly all the tannin contained in the wood is extracted. This solution is then concentrated in vacuum into a heavy liquid of approximately 48 per cent Tw., which is called extract. As a matter of fact the production of chestnut wood extract on a commercial scale is surrounded with innumerable technicalities,

which have a profound effect upon the successful conduct of the business.

There are forty-three plants engaged in the manufacture of tanning extract exclusively from domestic materials in the United States. These plants have a productive capacity of 894,414,460 pounds of 25 per cent tannin extract per year. During the past few years the tanning business has been in the throes of the most severe depression ever experienced in the industry. This situation was reflected in the production of tanning extracts, which during 1922 amounted to 428,515,175 pounds of 25 per cent extract or is the equivalent of 48 per cent of the capacity of all the plants. During 1922 the manufacturers of chestnut wood extract consumed 497,000 cords of chestnut wood (160 cubic feet per cord). The domestic consumption of chestnut wood extract during 1922 amounted to 237,920,000 pounds, so that even on the very curtailed basis of production during that year, there was a large surplus of extract produced.

Chestnut wood extract has to compete with tanning materials imported from all quarters of the globe. Quebracho from South America, wattle bark from South Africa, valonia from Turkey, myrabolans from India, mangrove bark from East Africa and Borneo. All of these materials are produced in tropical or semi-tropical countries where native labor is abundant and cheap.

It is less than fifty years ago since all of the leather produced in the United States was obtained from the use of hemlock and oak barks and it was thought that the supply of these materials was inexhaustible within our borders. Today hemlock and oak barks are the highest priced materials used in the tannery and their supply is becoming scarcer with the exhaustion of the forests.

In chestnut wood the tanning industry of the United States possesses its most valuable asset for the making of leather. It is, therefore, of the greatest importance to that industry to ensure a continuity in the supply of wood. The ravages of the chestnut blight, which has already destroyed the chestnut throughout the eastern part of the country and has now made its appearance in the heart of the southern Appalachians, gives occasion for genuine alarm to those who have given any thought to the protection of American industry and particularly with reference to our independence of foreign sources of supply of essential raw materials.

With the threatened destruction of the entire stand of chestnut, the United States will become entirely dependent upon foreign sources of supply of materials with which to produce its leather, which is so essential a commodity for the well-being of the people, both in times of peace and war.

The dependence of the leather industry upon the science of forestry is obvious and it may not be too broad a statement to say that the whole industrial fabric of the country rests on the products of the forests as one of its principal supports. In the case of chestnut, we have a wood which is practically capable of supporting the whole leather industry of the country for generations to come if the principles of good forestry were practiced. Yet, speaking nationally, we know nothing whatever about the chestnut tree and only in a very limited quarter is there any feeling of alarm over the prospect of this most valuable national asset being wiped out.

The provision of the McNary bill, which is now before Congress and which provides for steps to be taken to afford our forests some protection against diseases, furnishes the only prospect for some action to be taken to conserve our supply of chestnut wood.

While it is undoubtedly true that our American tanning industry will continue to produce leather with or without American tanning materials, yet it is scarcely conducive to our national pride that we must henceforth be dependent upon foreign sources of supply for the production of an article like leather, the use of which of itself is a measure of our civilization.

SOME DEVELOPMENTS IN PENNSYLVANIA FOREST NURSERY PRACTICE

By Geo. S. Perry [1]

Because of the relatively short time needed to get results, no phase of forestry offers the investigator a fairer field than nursery practice. It is also an inviting field because of the host of problems that present themselves on every hand. Many of these problems are quite simple of solution, and of the more complicated ones, many may be resolved by analysis into a series of simple ones. These facts explain why student-investigators at a forest school so often turn their attention to the problems of the forest nursery and do good work toward their solution.

The following paragraphs describe briefly and in a general way several of the numerous lines of work recently taken up in the Pennsylvania State Forest School nursery.

SOIL AMENDMENT EXPERIMENTS

Soil is always a prime consideration in conservative forestry and is especially so in the successful production of coniferous seedlings in the nursery beds. Unless the forest nursery is located on remarkably open and friable soil, early spring digging operations will compact it so satisfactory tillage is impossible for months. This has been found emphatically true during the last few years since private planters have learned the desirability of doing their work before the ground loses its accumulated moisture supply. In many nurseries this trouble is obviated by alternating a fallow year between crops of seedlings, but with limited areas available for beds and an ever increasing demand for planting-stock, fallowing and green manuring are often out of the question. Of course, on rich humous soils, no detrimental effects attend or follow their working while quite wet and successive crops of coniferous seedlings can be grown without resorting to other measures than good cultural practices.

[1] Read before the Allegheny Section of the Society of American Foresters, at Harrisburg, Pa., February 29, 1924.

However, not all forest nurseries are located on optimum soils, to begin with. Often other considerations of weight operate to force the selection of rather adverse sites. The Pennsylvania State Forest School nursery at Mont Alto, Pa., had originally a heavy loam soil, though portions of the site had been modified considerably by use as kitchen-gardens prior to being used for nursery purposes. On this area coniferous seedlings were at first grown with great difficulty; losses from all sources being abnormally high. In fact, at one time the site was declared impossible for all species except black walnut and similar hardwoods; since the proportions of sand and clay present probably approximated those used in the "sand-clay" roads of the South, and made a soil even more unsatisfactory than pure clay would be for coniferous seedling production.

Investigation early proved that this soil could be favorably modified by heavy applications of charcoal screenings. About ten bushels of this charcoal was applied per 100 square feet at first. Afterward at intervals of about four years, an application of half this amount sufficed to maintain good physical condition, rendering the soil easy to work and greatly reducing fungous troubles. The only drawback to this amendment of the soil is the limited available quantity of charcoal and the prohibitive cost of a future supply. This led to experiments with partly decayed hardwood sawdust, anthracite coal ashes, woods humus, and hemlock-sphagnum muck. Of these four, the last two have long been of acknowledged merit, but the first two are of greatest interest due to their cheapness and general availability.

To test the efficacy of sawdust, four beds were laid out, each of 100 square feet area. The first bed was modified by adding ten bushels of sawdust, the second was an unmodified check bed, the third received six bushels of sawdust, and the fourth a like quantity of charcoal screenings. In applying, about 70 per cent of the amending material was spaded into the ground and 30 per cent raked in on top and used in mixture with sand and compost for covering the seed. The following table shows results with white pine during the first growing season.

	Seedlings per square foot	
	June 14	*Sept. 11*
Bed modified by adding 10 bushels of sawdust	62	105
Unmodified soil (check bed)	36	53
Bed modified by adding 6 bushels of sawdust	51	124
Bed modified by adding 6 bushels charcoal screenings	40	133

These results apparently indicate that sawdust from hardwood species applied to the soil in a partially decomposed state, amend the soil just about as favorably as charcoal, so far as growth of white pine seedlings is concerned.

It has been noted in times past that losses from the "damping-off" fungi were less serious in those nursery beds where chemical tests showed the greatest acidity of the soil. It is hence logical to suppose that sawdust will affect the soil favorably in this direction. The growth and thrift of trees raised in the modified beds exceeded those in the check bed and no difference could be seen between charcoal and sawdust.

While the above results for white pine seedlings are promising, it will be interesting to follow developments during the next two years and then make careful and exhaustive comparisons. Further tests with other species will also be made.

Results with coal ashes do not equal those on charcoal amended soils, although better than we ever got on the unmodified site. White pine seed germinated well and showed unusual promise for about two weeks, then fungus troubles developed after a rainy period of two or three days. There also seemed to be complications from light injury due to the unnatural whiteness of the soil, which contrasted sharply with the charcoal amended beds.

PRODUCTION OF HEMLOCK SEEDLINGS

Woods mold and muck were used in a study of hemlock. This tree has been grown in the past only in small numbers and usually on a very inefficient basis—judging by tree percentages. It fails almost utterly at Mont Alto on charcoal modified soil. Investigations followed the same outline above described for white pine grown on sawdust, except that check beds were unmodified and seed was sown therein December 1 and May 1. Comparing all beds, the autumn-sown unmodified bed shows best results. Yet this is only due to the delayed, irregular, and prolonged germination which always occurs when seed of our eastern hemlock is sown in the spring. This indicates emphatically that hemlock seed should always be sown in the autumn, just as soon as it can be extracted. Beds should then be covered with a heavy mulch till early spring when the seed makes very full, vigorous and even germination. Comparisons limited to spring-sown beds prove the value

of soil modification in the direction of greater humus content and higher acidity, as these beds show nearly twice as many seedlings per square foot as similar unmodified ones, yet only about half as high a count as such a tolerant species ought to show as a minimum. Fall sowing combined with soil amendment seems indicated as the right method of producing this tree.

From the above facts, it is probable that the thin coat of hemlock seed permits loss of vitality and energy by dessication when seed is stored over winter in bags at ordinary air temperatures; or else the species needs the stimulus of cold combined with moisture which is only possible when the seed is in the ground.[2]

The effect of one-half and three-fourths shade over hemlock seed beds was also investigated. Results were better under one-half shade than under heavier, which was unexpected and seems illogical for such a tolerant species. The heavy watering of all beds may account in part for this result, which might be reversed with less frequent watering.

Germination of hemlock seed has been found intimately related to soil temperature variations and moisture conditions. The most favorable conditions are present when the soil is nearly saturated and nocturnal temperatures drop nearly to freezing point. Seed sown in early spring promptly makes considerable germination if the above favorable factors are at hand, then all during the succeeding growing season only a few weakly seedlings may appear; but when the frosts of autumn come, even better germination than occurred in early spring usually comes up in these beds. But these trees are only born to die, as it is nearly impossible to preserve them under field conditions.

GERMINATION AND EARLY GROWTH OF SHORTLEAF PINE

In respect to nursery practice, shortleaf pine is almost the direct antithesis of hemlock. Its seed is the last to germinate among all the species we have ever attempted to grow in Pennsylvania. In the northern part of the State only very imperfect and incomplete germination can be secured at all. High soil temperatures are necessary to its rapid and strong germination. Seed beds should be only very thinly mulched with litter and even this may have to be removed before most of the seeds show signs of life. As regards covering of beds, syca-

[2] See Journal of Agricultural Research, Vol. XX, No. 2. Article by Frederick V. Coville.

mores and mulberries also require the heat and light of the direct rays of the sun for satisfactory germination.

Fall sowing of shortleaf pine has only been once attempted and then resulted in nearly absolute failure. The seed used in this instance had been held over summer in a tight wooden chest in a dry cellar and seemed good by ocular inspection, hence no other tests were made, as the same seed sown the preceding spring had made almost perfect germination. The seed of this tree (*Pinus echinata*) has been stored at ordinary room temperatures for ten years and still gave a field germination of 6 per cent;[3] hence it is fair to surmise that the rigors of winter were detrimental, and that seeds were viable when sown. Yet this reaction seems directly contrary to the indications of nature, attested by the autumn opening of all the cones of this species.

Shortleaf pine seedlings must of necessity be dug when two years old. If permitted to stand in the seed beds longer than this, two adverse factors become of importance:

(1) The roots, especially deep-going tap roots, are so long at end of the third growing season that nearly all of the fine rootlets and root hairs are sacrificed in digging, which very much decreasses the percent of establishment and rate of early growth.

(2) Depending on vigor of growth, about the third year an S-shaped double curve develops in the axis of the tree at the root-collar. This is weak in resisting the vertical stress brought to bear when lifting seedlings, as quite a hard pull is usually needed to disengage the long roots that have formed. Many trees are broken off or injured, so that loss from this source is quite considerable. This root-collar curve is an important protective adaptation of the species relative to fire or any factor that destroys the top, as it is densely beset with latent buds which develop vigorously under the stimulus of serious injury; being thus responsible for the fire-proof character of the tree in early life.

LOBLOLLY PINE IN PENNSYLVANIA

It has been a surprise to see how well the Loblolly pine (*Pinus taeda*) of our Southern Coastal Plain grows and resists winter cold in the Cumberland Valley of Pennsylvania. It is unlikely that the practical range of this tree can ever be extended to include more than the extreme

[3] See JOURNAL OF FORESTRY, Vol. XIX, No. 7, page 814. Note by J. W. T.

southeastern corner of the State, but we can successfully grow the seedlings much further north and inland when seed is collected in New Jersey, Delaware, or Maryland. Trees from Maryland seed have now come through their second winter at Mont Alto in perfect condition as regards resistance to frost. In height growth they surpass any stock of the genus ever raised there; as may be noted from the following table from recent inventory sheets:

Species	Average height of 2-year-old seedlings	Species	Average height of 2-year-old seedlings
	Inches		*Inches*
White pine	5.5	Japanese red pine	9
Jersey pine	9	Nut pine or pinon	5
Austrian pine	6	Shortleaf pine	8
Western yellow pine	7	Pitch pine	8
Red pine	5	Loblolly pine	14
Scotch pine	8.5	Arborvitae and Norway spruce	4
Jack or Banks pine	12	Japanese and European larch	12
Table mountain pine	12		
Chinese red pine	7		

SEEDLING LOSS DUE TO CROWDING

About mid-summer the forest nurseryman is usually required to get out an estimate of the yield from all blocks of stock which will be available for removal in the fall and following spring. The great divergence between these estimates and actual inventories at the end of the growing season is often a matter of surprise and chagrin to the one who makes them. This divergence is difficult to explain in many cases. Losses in fully stocked beds are usually estimated on the basis of tolerance and height growth of the species, so long as no fungous calamity or other similar trouble intervenes. Favorable or unfavorable soil moisture and general weather conditions are also considered. But there still seem to be other special silvical features of species that enter the equation, and these can only be understood and counted on in the light of experience.

The table following, compiled from approximately full or optimum stocked blocks of various seedlings during the past three or four years, shows about what losses may normally be expected with several of our common or most promising tree species.

Species	At 1 year old		At 2 years old		At 3 years old		Per cent of loss
	Height, ins.	Number per sq. ft.	Height, ins.	Number per sq. ft.	Height, ins.	Number per sq. ft.	
White pine	3	96	5	58	10	44	40 and 24
Japanese black pine	2.5	51	4	[b]42	10	42	18 and 0
Norway spruce	2	[a]120	5.5	122	9	83	0 and 32
White spruce	1.5	[a]87	3	88	6	88	None?
Jack or Banks pine	4	145	12	100	.....	.....	31
Japanese red pine	3.5	88	7.5	62	.....	.....	29
Shortleaf pine	2	56	8	55	.....	.....	None
Western yellow pine	3	[a]58	9	60	.....	.....	None
Scotch pine	2.5	63	8.5	56	.....	.....	11
Table Mtn. pine	4.5	[a]85	12	86	.....	.....	None
Red pine	1	[a]90	5	93	.....	.....	None
Austrian pine	3	69	6	70	.....	.....	None
Jersey pine	4	[a]142	9	126	.....	.....	11
Arborvitae	2	72	4	56	.....	.....	22
European larch	4	36	12	28	.....	.....	22
Japanese larch	4	60	12	32	.....	.....	47
Red oak	8	[b]56	15	19	.....	.....	66
Green ash	15	49	20	25	.....	.....	48
Rock oak	7	39	12	26	.....	....	33

[a] Low counts when small trees were inventoried for the first time must be charged to the vagaries of student assistance in counting; or their discounting too heavily to comply with the rule that only trees with good terminal buds and other evidence of thrift were to be recorded.

[b] Presence of white grubs probably reduced the stock in these blocks somewhat below a normal figure and also decreased the height growth.

This table attests the influence of intolerance and rapid height growth as the important factors governing losses of seedlings through natural crowding, but it also serves to indicate quite forcefully in case of the hard pines, that there are certain inherent powers of persistence possessed by these species which prevents in a large measure the heavy losses noted for other intolerant trees, as exemplified in the larches and oaks.

The data in the table also raises the question whether seed of high quality and tested viability should be sown so heavily as is usually the custom. This question is especially important where trees are not transplanted in the nursery at one or two years, but instead are outplanted when two or three years old. The form and vigor of all the trees in a bed certainly suffer when losses are so considerable as Norway spruce and the pines show when held for three years in the seedbeds.

A COMPARISON OF THE SALARIES OF FORESTERS

By W. E. Montgomery

Chief, Office of Maintenance, Department of Forests and Waters, Pennsylvania.

In order to compare the salaries of foresters paid by various organizations, both public and private, under a great variety of conditions of employment, requests for information were sent to the National Forest Service and to seven States in addition to Pennsylvania that were known to have forestry organizations which might be considered as representative of the profession in State work. Inquiries were also directed to twenty corporations employing technically trained foresters. To these inquiries, replies were received from the National Service, from all of the States from which information had been requested, and also from fifteen private companies, including those interested in lumbering, railroads, mining, and the manufacture of paper and pulp. From the replies so received the tabulation, Table 1, has been made.

In the case of the United States Forest Service, the figures used were taken from the schedule as provided by the Classification Act of 1923 with regard to salaries at Washington, and in accordance with the report made to the Personnel Classification Board with regard to the field service. Appropriations made on a basis of these schedules have not been passed (Feb. 1, 1924), but there would seem to be every indication that salaries will be made effective as listed below. In all other instances, the actual salaries now being paid or the present established limits for compensation for the various positions were used as a basis in the preparation of the table.

In making a comparison of the salaries paid by State, National, and private organizations to the technically trained foresters in their employ, the first and greatest difficulty encountered was the fact that no two organizations are constituted alike and that as a result of this there is a considerable variance in the nomenclature used in designating positions and in the work performed by the incumbents of these different positions. In order to obviate this obstacle, a classification of positions has been formulated, taking into consideration the duties indicated in the reports received from various sources, with the idea that as nearly as possible each position so indicated could be properly placed in this classification, thus rendering the salary of any position reasonably com-

parable with others of similar duties and responsibilities. For this purpose the following classification has been used:

(A) The executive head in charge of the forestry work of the organization considered.

(B) Assistant head of such organization.

(C) In practically independent chief administrative charge of a division of very considerable size and great importance within the main organization or in charge of highly specialized technical work—for example, district foresters in the National Forest Service, and chiefs of certain experiment stations.

(D) Assistants in charge of the more important subdivisions of the units indicated in "C," or chiefs of subdivisions or bureaus having less responsibility and relative importance, or in charge of inspection work on large areas and having broad supervisory powers, or conducting research and experimental work along lines requiring less extended technical training and experience than indicated in Class "C" such as bureau chiefs in Pennsylvania, State fire warden in New Jersey, assistant district foresters and district inspectors in the National Service.

(E) Assistants in charge of less prominent subdivisions in units described in "C" or exercising independent supervision over operations in the field or being responsible for all work on units or districts of considerable extent, such as supervisors in the National Service and district foresters in various state organizations.

(F) Duties similar to those described in Class "E" but requiring less experience, being more limited in extent and of somewhat less importance—for example, certain lower grades of the positions enumerated under "E."

(G) Assistants to Class "E" and "F" or those doing responsible investigative work of an independent nature, but under immediate supervision such as assistant district foresters in the State organizations and assistant supervisors and examiners in the National Service.

(H) In charge of special work of minor importance, not requiring extended experience, and exercising independent judgment only to a limited extent, such as forest assistants and junior examiners in the National Service, silviculturists, nurserymen, and those doing miscellaneous routine work in the various State services.

(I) Performing simple and elementary work under immediate supervision, requiring special training, but not necessarily any experience—the beginners' grade.

TABLE 1.—*A Comparison of the Salaries of Foresters.*

	A	B	C	D	E	F	G	H	I
U. S. Forest Service	$7,500	$6,000-7,500	$5,200-6,000	$3,300-5,000	$3,300-3,800	$2,700-3,600	$2,400-3,000	$1,860-2,400	$1,680-2,160
Pennsylvania	8,000	6,000	.....	3,600-4,500	3,000-3,500	2,640-3,000	2,160-2,640	1,800-2,400	1,500-2,160
New Jersey	3,000-4,500	2,700-3,300	.....	2,700-3,300	.....	1,900-2,500	.....	.....	1,500-1,800
Maryland	3,800	.....	.....	.....	.....	1,800-2,500	.....	.....	.....
Minnesota	4,000	2,700	.....	2,500	2,200	.....	2,000	2,000	.....
Virginia	4,000	3,000	.....	2,500	2,400	.....	.....	.....	.....
New York	5,000	3,500	.....	.....	2,200-2,600	.....	.....	.....	1,500-2,000
Ohio	4,500-5,000	.....	.....	2,500-3,000	.....	2,000-2,500	.....	2,000	.....
Tennessee	3,600	.....	.....	.....	2,000-2,500	.....	.....	.....	.....
PRIVATE									
Employing only 1 or 2	.....	.....	.....	.....	1,800-2,400	.....	.....	.....	1,200-1,800
Small organizations	2,500-4,500	2,000-3,100	.....	.....	.....	1,800-2,400	.....	.....	1,200-1,800
Large organizations	3,500-10,000	2,400-4,800	.....	.....	2,400-3,200	2,000-2,800	.....	.....	1,200-2,400

Consulting foresters—Varying rates. The highest reported was $[illegible]00 per month plus all expenses.

In scrutinizing Table I, it immediately becomes apparent that in the two lower grades the figures of all organizations are very much the same. In all other classes the schedule of salaries of the National Forest Service is highest with Pennsylvania second, except in Class A where Pennsylvania ranks first. In this connection it must be remembered that the Pennsylvania Secretary of Forests and Waters is not only the Chief Forester of the State but has numerous other functions besides. His Department, in addition to its forestry activities, also includes the Bureau of Water and Power Resources, the State Topographic and Geologic Survey, and the various State parks, while the Secretary himself by virtue of his office is a member of numerous boards and commissions not usually associated with forestry work. The head of the Department, however, is a technically trained forester, dealing principally with forestry problems, and the salary was originally determined by statute at a time when the work of the Department was restricted to forestry matters.

The fact that salaries in the National Service and Pennsylvania Service are generally higher than in the various other States is the result of a number of contributing factors. As far as Class "A" is concerned, it would naturally be expected that the heads of these two organizations would receive higher salaries than those occupying similar positions in other States, since in the National Government and in Pennsylvania considerably more importance has always been attached to forestry work and to forestry problems, and as a result far larger and more intensive organizations have been formed than is the case elsewhere, with correspondingly greater responsibility resting in the chief executive officers. With regard to the other positions in the United States Forest Service, and this is applicable to some extent to the Chief Forester, of greatest importance is the fact that the figures given for this organization have been based upon the tentative schedules resulting from the reclassification of salaries now being effected throughout the entire National Government. Likewise, in Pennsylvania, after a thorough investigation by competent experts, a system contemplating the classification of all salaries paid by the Commonwealth was formulated and for certain units made effective October 1, 1924. In the Department of Forests and Waters this has resulted in raising salaries to a point more nearly on a par with those paid to members of other professions in governmental work having equal training and experience, doing similar work and occupying positions of the same relative importance and re-

sponsibility. A step in this direction had already been taken during the administration of Gifford Pinchot as Commissioner of Forestry. At the time of his entrance into that office in 1920, the salaries paid in what was then the Pennsylvania Department of Forestry were extremely low and entirely inadequate and had been so for a number of years. A thorough reorganization of the entire Department was effected, resulting in a decrease in the personnel with increased responsibility for those remaining. The forestry situation in the State was brought forcibly to the attention of the people, and with increased public interest came a widespread demand for more money for forestry work followed by a response on the part of the legislature in the form of a substantial increase in appropriations. This made it possible to make certain increases in the salaries of the Department, thereby giving to all its members at least a decent living wage. Even with the increases so obtained, however, the salaries paid by this Department were still considerably lower than those paid to employes of other departments occupying comparable positions, and it was not until the standardization of salaries throughout the State Government was made effective that the salaries were placed upon a just and equitable basis. From comments which have been made it seems certain that in a number of other States the situation with regard to foresters' salaries is similar to that which existed in Pennsylvania four years ago, and that the discrepancy between the compensation paid to foresters as compared with that received by members of other professions employed in governmental service will continue until an organized effort is made to equalize salaries in all departments such as is now being accomplished in the Federal Government and has already been made effective in Pennsylvania.

In private work, the salaries in the larger organizations compare favorably with those in the National Service and in Pennsylvania, while in the smaller organizations, the compensation is approximately the same as in the various other State departments. This difference is in the main due to the same basic causes that have been noted in referring to the variance existing in governmental salaries, and in the final analysis is expressive of the degree to which the importance of forestry itself is recognized and with it, the justice of the members of this profession receiving compensation for their services equal to that obtained in other lines of work requiring similar technical education, experience and natural ability.

REVIEWS

The Chemical Utilization of Wood in Washington. By H. K. Benson, T. G. Thompson, and G. S. Wilson. Bulletin 19, Engineering Experiment Station, University of Washington, Seattle. November, 1923. Pp. 160, tables 72, figures 22.

Probably no one has been more interested in or more eager in recent years to utilize the wastes resulting from logging and milling than the lumberman. From every lumber producing region comes the demand for information and advice as to what can be done with these wastes to rescue their intrinsic values from the refuse fire. However, very little has as yet been done to put these wastes to a profitable use, and for a good reason—it has in only a few cases paid to do so. But the general conclusion regarding the chemical utilization of wood given in this bulletin makes the future of waste utilization in the West seem hopeful, for, quoting directly, "many of the concerns engaged in the wood products industries have attempted the enterprises on too small a scale, the high overhead charges being more than the products could sell for. In many cases, too, the equipment employed was not of the conventional type but generally the design of some inventive enthusiast. In recent years the export trade has opened up many new markets for the products of this industry and numerous technical improvements have lessened the cost of production. With an unmeasured supply of wood now unmerchantable, it is safe to predict that in the near future, the wood products industry will become established in the Pacific Northwest."

This bulletin brings under one cover the results and reports of a number of studies made by the scientific departments of the University of Washington over a number of years and heretofore unpublished or otherwise not readily available. There are general paragraphs describing the steam and destructive methods of wood distillation; the methods of extracting tannin; pulp and paper products on the Pacific Coast, and the manufacture of producer gas from hogged mill waste; but most of the bulletin is given up to a presentation and discussion of the results of the experiments and the possibility of using western wood wastes for turpentine, pine oils, alcohols, charcoal, gas, acetic acid, tannins, pulp and paper products, wood plastics, and other products. Seventy-two tables, summarizing and comparing the results, made an invaluable addition to the work, many of them giving the amounts of the various products yielded by the waste wood under the experimental methods of treatment.

E. F.

PERIODICAL LITERATURE

SILVICULTURE, PROTECTION, AND EXTENSION

Cultivation of Larch in Denmark

Originally the forests of Denmark consisted almost exclusively of hardwood species; two coniferous species, *Juniperus communis* and *Taxus baccata* being indigenous in limited quantities. Conifers were first introduced early in the 17th century as ornamentals. Their value was quickly recognized and it was only a short while before they were used in forest planting. At present the area occupied by coniferous trees amounts one-half the total area of woodland.

This report traces the history of the introduction and subsequent planting of larch (*Larix europaea*) in Danish forests. The famous German forester, Georg V. Langen, is credited with introducing the tree into Denmark. Doubtless there may have been individual specimens planted in Denmark before V. Langen began his work, but it was not until the middle of the 18th century that any forest plantings were made. The source of most of the seed used in the Danish forest plantings has been traced to the Mittelwald in the Tyrol region.

The early plantations made rapid growth, foresters generally were much in favor of the tree. Their enthusiasm is reflected in the Royal Forest Order of 1787 which provided for the planting of larch and pine but did not mention spruce or fir which were destined to become important in planting work. In 1797 the Exchequer, who apparently controlled the forests at that time, ordered the gathering of 1,000 pounds of larch seed from the plantations. As early as 1800, rules for thinning were being discussed for larch plantations. But the foresters of Denmark were doomed to disappointment.

Beginning about 1830 the large pure plantations of larch began to show signs of failure. The rate of growth seemed to fall off and the stands were attacked by various fungi and insects. Among the most important pests were *Dasyscypha wilkomii* and *Nematus Ericsonii*. All precautionary and remedial measures seemed fruitless. The popularity of the species waned until nearly all planting ceased.

During the World War there was a demand for larch to be used for masts and ship timbers. This demand brought the value of the tree

back to normal. It became once again a tree of economic importance. Foresters began to study the few remaining plantations of larch to determine, if possible, the cause of previous failures. There were available three plantations over a hundred years of age.

The conclusions based on a study of the Linghuse plantation are typical. This plantation dates back to the year 1776; the exact date of planting is not known. From the description we are led to assume that the larch in the plantation is merely a remnant of the original plantation. The larch was planted in mixture with beech which seems to be a rather fortunate mixture of species.

The failure of the larch stands to thrive beginning about 1830 is accounted for by unfavorable climatic conditions. During the period of 1828-45 there was a series of years with the mean temperature below the average normal for 109 years and with a precipitation above the normal. The mean temperature for this period was below that for the region from which the larch seed was secured while the precipitation was higher. This apparently created growing conditions unfavorable to larch but favorable to the spread of parasitic fungi. Apparently the stand was old enough so quite a number survived.

Some of the growth figures are of interest not because of the large yields but as an indication of what the species produced under adverse conditions. The largest larch found in the plantation was 33 inches in diameter and 113 feet high at 145 years. The following tabulation is taken from a sample acre in the plantation at 95 years of age:

	Beech	*Larch*	*Total*
Age, years	95	95	
Number trees per acre	134	21	155
Height, feet	66.9	82.3	
Volume, cubic feet	4,460	2,201	6,661

The yield in cubic feet is, of course, small, but the number of trees would seem to indicate a density of stocking below normal. It is interesting to note that larch, with but one-sixth of the total number of trees, constitutes one-third of the total volume.

An interesting side light is brought out by a statement concerning the tax record of 1806. From this record the authors secured a complete stand table by height and diameter classes. Apparently individual trees were taxed at that time. This but serves to bring out the intensive practice necessary in their forests.

There is an interesting account of the probable origin of the Dunkeld variety of larch in Scotland. The supposition advanced by the author

is that thrifty seedlings were introduced instead of seed. These seedlings were probably secured in the Churwald region near the source of the Rhine. The seedlings were probably natural reproduction in thrifty stands of well formed trees.

The general conclusion arrived at concerning the planting of larch in Denmark is that it is entirely feasible. Great care should be used in selecting the proper type of soil. It should never be planted in pure stands. Thinning should be made at an early age to keep the stand as vigorous as possible. The successful production of larch will present new problems which must be solved by the foresters. Larch has become economically important enough to warrant considerable thought.

The entire discussion gives one an entirely new viewpoint on the use of exotic species. This study covering a period of a hundred and fifty years would seem to indicate that possibly we have not given many of the exotic species planted in this country a fair trial. The work in Denmark and Scotland indicates that it may be possible to extend the range of trees through selection of hardy individuals.

T. S. HANSEN.

A. Oppermann—*Det Forestlige Forsogsvaesen i Danmark Syvende Bind Haft* 1-1923.

MENSURATION, FINANCE, AND MANAGEMENT

Modern Hypsometers

Discussion of the principles and use of the newer hypsometers of various kinds with special emphasis on ease of application. The Faustman hypsometer has been abandoned to a great extent in European practice. Other instruments, such as the Standard Forest Service hypsometer, the Forestier's hypsometer, H. Prytz double hypsometer, and Segelcke's hypsometer are coming into use. Development and use of Schmalkalder's principle is traced through various stages to the Forest Service hypsometer, which, by practical tests results in less error than Faustmann's or Christen's. The principle of Christen's hypsometer is seen in the Forestier's hypsometer, which seems even more accurate than the Forest Service instrument. Prytz's idea is based on the assumption that the heights of trees are distributed according to the probability curve. The average height of the stand is sought. Christen's principle is again elaborated. The trees fall into three groups. The boundary heights are set off on the hypsometer and when in use, note is made into which group the tree falls. Actual

heights are not taken. Segelcke's hypsometer, following also Christen's principle, is especially applicable for estimating merchantable contents of trees. **W. H. Meyer.**

Find, J. R. *Moderniserede Højdemaalere.* 34 p., 12 fig., Copenhagen, 1922.

MISCELLANEOUS

Indian Forester

A review of the past ten numbers of the Indian Forester shows that it contains a number of interesting articles:

"The Forests of Hesse-Darmstadt" (p. 368) describes the computation of the yield and how "regeneration in small patches" is carried out. Apparently the beech is being replaced by coniferous stands largely by artificial means. On account of the food shortage in Germany, it is interesting that the regeneration of the forest crop is combined with the cultivation of field crops.

"A General Modification of Von Mantel's Formula" (p. 393) develops an improved formula which is illustrated graphically and which is designed for cases where the wohle of the growing stock cannot be estimated. A further discussion of Von Mantel's formula is given on pages 497 and 527.

Judging from "Forest Department and the Axe" (p. 397) an attack has been made by the Inchcape Economy Committee to reorganize the forest service on the grounds that it is not on a business basis. The area now under management is classified under four heads:

(1) Forest whose preservation is necessary for physical or climatic reasons.
(2) Timber producing forests.
(3) Fuel, timber, and grazing forests.
(4) Pasture lands.

From the figures cited on page 402, it appears that the average annual surplus has increased from about $150,000 in 1864-69 to over $5,000,000 for the period of 1914-19. If the growing stock has been maintained, this increase in revenue appears to be favorable, especially since the percentage of net to gross income has also increased from 36.4 to 43.1 per cent. This certainly is very much superior to the financial results obtained by the Forest Service, U. S. Department of Agriculture. A further defense of the department is given by Sir William

Schlich on page 168 in the March, 1924, number and by Sir Eardley-Wilmot (p. 683).

There is an interesting article entitled "Systems of Sales of Timber in the U. P. Forests" (p. 543), and the monopoly plus royalty system is criticised and a new royalty method of sales proposed. Lump sum sales are also discussed.

"State Control of Private Forests" (p. 583), summarizes the control of private forests in France, Switzerland, England, Prussia, Austria-Hungary, and Spain. In India "in order to introduce sound management on the principle of sustained yield, . . . acquired private forests on the system of lease. This system has worked admirably well without any friction, and it is impossible to think of a system of State control showing greater respect for the individual rights. In fact, a wiser step in relation to private forests in danger of destruction cannot be placed to the credit of any forest administration in the world." This article is of wide interest, but unfortunately is rather fragmentary.

Sir William Schlich's article on the regulated selection forest (p. 617) is quoted in full from the Empire Forest Journal of April, 1923.

It is known that the Indian Forest Service is trying to adapt American steam logging methods to Indian conditions. An interesting experiment at Sukna in Bengal (p. 633, 1923, and p. 1, 1924), gives the relative results of the hand labor method of exploitation as contrasted with modern machine methods. It will be interesting to see whether the management disadvantages of the American method of large scale logging can be provided for in Indian working plans. Judging by the Sukna experiment, the clear cut areas are to be of comparatively small extent and distributed according to the needs of silviculture and regulation.

In addition to these articles enumerated there are interesting reviews of forest administration reports as follows: Page 558, Bengal Forest Administration Report for the Year 1921-22. Page 608, Progress Report on the Forest Administration in the Punjab for the Year 1921-22. Page 665, Burma Forest Administration Report 1921,22. In these reviews there is a discussion of personnel, areas, working plans, research, fire protection, improvements, utilization, etc.

T. S. W., Jr.

The Indian Forester, June 1923 to March 1924, inclusive. Pp. 281-690, pp. 1-173.

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Compiled by Helen E. Stockbridge, Librarian, U. S. Forest Service.

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NOTES

The Editor's Dilemma

The Journal is faced for the first time in its existence with a peculiar problem. As the May issue goes to the printer, there are left on the Editor's hands over twenty-five original contributed articles which could not be accommodated in the Journal during the year. During the four-month interval, June to September, a number of additional contributions will come in, and the gap between what the Journal can print and what is being contributed is bound to grow.

What shall we do? In the past, the task of the Editor was comparatively simple. He looked upon the professional organ of the Society as a reflection of the growth of its workers. He felt that it was not within his prerogatives to sit as a judge and decide what should go in and what should not, so long as the contributions came up to a certain standard of presentation and were motivated only by a desire of helping the progress of our forest knowledge. Moreover, if the Editor had become too critical, the intellectual output would not have been enough to have kept a technical forestry periodical alive.

The situation is now materially changed. The profession is growing and has learned to articulate technically and literally, and the output is beyond the capacity of the Journal to absorb.

There are two possible solutions to this situation. One is to make the Journal a monthly publication. This would provide four more issues for the publication of the surplus material. It would also mean, however, an increase of one-third in the cost of the publication. The second is to revise the standard of the contributions to the Journal. If we did so, what should be the basis for such a revision, and how could these higher requirements be so formulated that all contributors would recognize and live up to them?

The Editor does not want to set up standards entirely of his own. The Journal of Forestry is the organ of all the members of the Society. It is only proper that they should have a voice in the revision upward of our technical and literary standards. Incidentally, it will save the Editor from a great deal of grief if he does not have to do it on his own accord. If the readers of the Journal are sufficiently interested in the

growth of their magazine, and especially in its improvement, would they not be willing to go to the trouble of discussing this matter in the pages of the JOURNAL?

The JOURNAL must either become a monthly publication or it must set up a higher standard for contributions, which would reduce the number of papers that may be printed in it. R. Z.

POLYEMBRYONISM IN SUGAR PINE

The writer discovered, while experimenting with the germination of sugar pine seed, that twelve out of as many hundred seeds developed two young seedlings each. The seeds were previously placed in moist sand and the germination test carried on for a period of 140 days. The line drawing presented is an exact reproduction of two of the better specimens as photographed on the day of observation. These twelve interesting specimens represent seed collected from Lassen, Placer, Tuolumne, and Tulare Counties in California, in the Sierra range of this species.

FIG. 1. POLYEMBRYONISM OF SUGAR PINE. (Natural size).

Polyembryony is known to be rather common among the gymnospermous plants but it is rare that more than one seedling develops from the several embryos of a single seed. Gray [1] states that two or three embryos of equal size may quite commonly be produced in Coniferae. Coulter and Chamberlain [2] state that four separate embryos usually begin development but that [3] this is of little significance as but one embryo as a rule is able to mature. Dr. R. M. Holman of this university (University of California) has in his possession microscopic slide cross-sections of pine seeds that show several small embryos grouped about the radicle end of a single, large, central embryo. These smaller embryos had the appearance of being crushed by the growth of the dominant one. The polyembryony discovered in this experiment is therefore of particulary interest because two perfect seedlings developed and gave evidence of continuing their growth. It is a question, of course, whether or not the two seeds shown in the figure would have produced four normal trees.

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[1] Gray, Asa. Bot. Text-book. 6th ed. Part 1, p. 9.
[2] Coulter and Chamberlain. Morphology of Gymnosperms. Text-book, p. 275.
[3] Coulter, Barnes, and Cowles. Bot. Text-book, 2:820.

CIRCUMVENTING DELAYED GERMINATION IN THE NURSERY

One of the problems in producing western white pine stock economically at Savenac Nursery deals with delayed germination. This species, like other five-needle pines, has a strong tendency not to germinate all of its viable seed during the first season. With spring sowing the delayed, or second season, germination averages about 50 per cent, and is some times as high as 91 per cent, of the total number germinating. If 2-year-old seedlings are being grown for field planting, this delayed germination results in an unevenaged stand of 1-0 and 2-0 stock and necessitates culling the stock heavily, or else retaining it a year longer in the seed bed. Either practice is expensive and undesirable. Another disadvantage of spring sowing is that germination extends well into the growing season. This results in a large number of young and tender seedlings unable to survive, without protection, the hot days of July and August. Unless shade is provided, they die in large numbers from sun scorch and drought. Then in the fall these weak plants must be mulched to prevent frost injury, and this operation adds a further item of expense.

After experimental sowings at various dates in the spring failed to solve the problem, intensive experiments in fall sowing were initiated. These experiments extended over a period of six years. During this time over 100 samples of counted seed, or a total of 77,000 seeds, were sown and followed by periodic examinations through two years in the seed beds, and in some cases for several years after they were planted in the field. The final results showed that prompt and complete germination was secured the spring following fall sowing. In one case fall-sown plots had effected 83 per cent of their total germination before the end of May, while less than 14 per cent of the germination of spring-sown plots had been effected at that time. In another case germination from fall-sown plots was complete about 15 days before that of spring-sown plots had started. It was indicated that the first half of September, and possibly the last few days of August, was the optimum time to sow. Early sowing resulted in premature fall germinations which were lost over winter, and later sowing resulted in a marked decrease in total germination.

In fall sowing, therefore, prompt germination is secured, resulting in an even-aged stand and a lack of weaklings, due to late germination. Shading and mulching operations are unnecessary. Formerly, handling the shade frames was a considerable item, because they had to be removed and replaced several times a season for weeding operations. From the standpoint of shade frames and mulch alone, the saving of cost effected has amounted to nearly $250 a year at the Savenac Nursery. This, together with the saving of one year in seed bed space and the saving of plants which would ordinarily become culls, is a matter of considerable importance in the operation of Savenac Nursery with its annual output of 3 million plants and its growing stock of 10 million plants.

W. C. WAHLENBERG.

GROWTH RATE ON SECOND GROWTH HARDWOOD LANDS

In order to study the rate of growth and yield of second-growth hardwoods, the Forestry Department of the Michigan Agricultural College has measured the volume on different areas of second growth of various ages and constructed a preliminary yield table on the basis of the results obtained. The plots chosen represent as far as possible averages for second-growth stands following clear cutting where fire has not interfered with restocking, although most of them showed

evidence of having been burned to some extent at one time or another after regeneration was complete. The age determinations were based entirely upon the number of years since cutting of the original stand which in some cases was slightly more than the average age of the trees. It is very difficult to secure plots meeting the requirements of a yield table study, since most of the early cuttings were cullings and have not been succeeded by an entirely even-aged stand and since, owing to fire, much of the cut-over land exhibits a very low degree of stocking. Consequently the yield table is less complete than could be desired. It was found impracticable, from the plots obtained, to make a satisfactory differentiation into site classes based on soil qualities. Most of the plots were on land not locally classed as agricultural, although not the poorest in the region, consequently it was thought that the figures obtained correspond to Site Quality II and represent average conditions.

The table shows an average growth of eight-tenths of a cord per acre per year up to the 50th year. It was not practicable to secure data for a longer period. The volume growth is most active between the 20th and 30th years. At 30 years of age the volume slightly exceeds 25 cords per acre of wood suitable for distillation. This, when transportation conditions are satisfactory, is considered a sufficient yield to justify operations under present economic conditions.

A. B. R.

From Michigan Agricultural Experiment Station Special Bulletin No. 123, "Second Growth Hardwood Forests in Michigan," by P. L. Buttrick. September, 1923.

Dust Storms of Northern Idaho and Western Montana

There is a note on the origin of dust-fall on page 32, v. 5, of the Bulletin of the American Meteorological Society, February, 1924. During my twelve years' residence in Montana and northern Idaho, I have witnessed a great many dust storms. These storms, commonly known as "Palousers," have their origin in the desert region of eastern Washington and northeastern Oregon, and are of comparatively frequent occurrence. They are well known and despised by housekeepers in Kalispell, Missoula, Thompson Falls, Libby and all surrounding towns. The dust penetrates into every house and office, making it possible for any one to write his name on the furniture. When ac-

companied by rain or snow, the window panes and buildings are besmirched with streaks of red dirt. To have one of these storms happen immediately after painting a house is exasperating. The dust travels over the undulating Palouse region in northern Idaho where the deposits have laid the foundations for one of the richest wheat-producting counties in America. Petersen (see Science, January 27, 1923) proved by repeated measurements that this deposit amounted to two inches per century. The dust is laid down in the mountains of northern Idaho where it may be seen any day and anywhere during the summer months. Here it no doubt has profoundly influenced the growth and distribution of one of America's most valuable timber trees, the western white pine, for the best growth and development of this species takes place on the deep soils which lie directly in the path of the westerly winds carrying and depositing this dust. One very pronounced dust storm which many will remember occurred in March, 1917, when the desert region was dry and bare, but the forested area under cover of snow. At this time a sample of the dust as it had fallen on the snow in north Idaho was taken, the snow melted and the amount of dry soil weighed. This showed that the deposit in one single storm amounted to 600 pounds per acre. The dust was observed sticking to the limbs and leaves of trees generally in the Priest River Valley throughout the following summer.

Evidently these storms should be of more than passing interest in that they influence outdoor occupations, farm crops and timber production.

J. A. Larsen.

SOCIETY AFFAIRS

The North Pacific Section

The North Pacific Section has just completed a series of well attended open meetings. Every effort was made to interest lumbermen, timber owners, and all those connected with the forest industry to attend these meetings and enter into the discussions. The response has been gratifying. The meetings were held in Portland, Oregon, as follows:

December 21, 1923, E. J. Hanzlik, of the U. S. Forest Service, spoke on "Forestry and Lumbering in Sweden."

January 25, 1924, E. T. Allen, of the Western Forestry and Conservation Association, spoke on "Proposed Forest Legislation." A. W. Cooper, of the Western Pine Manufacturers' Association, discussed "The Encouragement of Private Forestry." T. T. Munger, of the U. S. Forest Service, had as his subject "The Extension of the National Forests."

February 29, 1924. This meeting was devoted to a discussion of what private owners are doing in practical forestry. J. A. Watzek, of the Crossett Lumber Company and Jackson Lumber Company, discussed the southern yellow pine region from the forestry standpoint. J. M. Walker, of the Crown Willamette Paper Company, described the forestry work in the Douglas fir-Sitka spruce region. N. G. Jacobson, of the Western Forestry and Conservation Association, took the yellow pine region of Oregon and Washington as his topic. O. M. Clark, of the Clark-Wilson Lumber Company, spoke interestingly on his observations of forestry in Japan.

March 28, 1924. This meeting was given over to forest taxation. The speakers included Governor Walter M. Pierce, George H. Cecil, of the U. S. Forest Service, Dean Hugo Winkenwerder and Professor Burt P. Kirkland, of the School of Forestry of the University of Washington, Dean George W. Peavy, of the School of Forestry of the Oregon Agricultural College, and Carl M. Stevens of the firm of Mason and Stevens, forest engineers.

April 28, 1924. D. T. Mason, of the firm of Mason and Stevens, forest engineers, talked on recent developments in forestry in the redwood region. A. J. Jaenicke, of the U. S. Forest Service, spoke on

pine beetle protection in Oregon and Washington with special reference to the large beetle control project now in progress in southern Oregon.

The newly elected officers of the North Pacific Section for the year beginning July 1, 1924, are as follows: Chairman, George H. Cecil; Secretary, A. J. Jaenicke; Member of the Executive Committee, Geo. W. Peavy.

The present officers of the section are: Chairman, David T. Mason; Secretary, A. J. Jaenicke; Member of Executive Committee, B. P. Kirkland.

This section includes the members of the Society in Oregon, Washington, British Columbia, and Alaska. The membership of the Section is made up of 42 Senior members, 30 Members and 2 Associate Members. The nominations and biographies of 14 candidates for membership are now under consideration by the Executive Council.

Summer Field Meeting of the Allegheny Section

The Allegheny Section, under the guidance of the Maryland Foresters will visit the famous Eastern Shore country of Maryland, lying between Chesapeake Bay and the Atlantic, on July 25 and 26. The Washington Section has been invited to join in the trip, and many have already expressed a desire to see the country which boasts of the farthest north stands of loblolly pine, bald cypress, red gum, and swamp cottonwood, as well as indigenous tree species found nowhere else in the United States.

There will be an excellent opportunity to observe loblolly pine under varying conditions both in natural and managed stands. Among the high spots are the following:

(1) Natural stands of loblolly pine, cutting 35,000 feet per acre.

(2) A 40-year natural stand of loblolly and spruce pine of equal mixture.

(3) Permanent sample plots in natural stands for growth studies.

(4) Thinnings on measured plots.

(5) Demonstration plots of reforestation on cut-over lands.

(a) By natural seeding.

(b) By planting.

(6) 800-acre forest of pine with mixture of hardwoods cut under marked scattered seed tree method.

(7) Local wood-using industries.

The trip will start at Hurlock, Maryland, at 1 P. M., July 25, will be over good roads, at a time when peaches, cantaloupes, watermelons, and other delectables, for which the Eastern Shore is noted, will be abundant. The wind-up will be at Ocean City, where a dip in the Atlantic may furnish a fitting climax. F. W. BESLEY.

MEMBERSHIP TERMINATED

The names of the following members have been removed from the rolls of the Society in accordance with the provisions of Article X, Section 3, of the Constitution:

Fred E. Brown, Box 35, Thompson Falls, Mont.
Leo W. Meyer, L. C. Smith Building, Seattle, Wash.
Howard Drake, Forest Service, Sandpoint, Idaho.
F. L. Kirby, Forest Service, Globe, Ariz.
Marcel F. Pincetl, Box 926, Santa Fe, N. Mex.
A. C. Volkmar, 294½ Brighton Avenue, Los Angeles, Calif.
Vance S. Brown, care Facht, Susanville, Calif.
N. L. Borden, Box 970, Leadville, Colo.
Wm. J. McCarthy, 4761 Richardson Avenue, N. Y.
W. R. Barbour, Fisk Building, 56th Street and Broadway, New York City.
C. W. Eaton, Clapp Memorial Building, Portland, Maine.
Philip R. Hussey, 65 Harthorn Avenue, Bangor, Maine.
Leonard E. Newman, care State Forester, Concord, N. H.
M. M. Burris, Broad Street Bank Building, Trenton, N. J.
Wm. West Morris, 1515 West 14th Avenue, Pine Bluff, Ark.
J. H. Lay, care Acme Tie Co., Reed City, Mich.

The following members have paid their dues for 1923 and are retired from the rolls in good standing.

R. F. Rhinehart, Forest Service, Flagstaff, Ariz.
C. K. Cooperrider, Forest Service, Albuquerque, N. Mex.

ANNUAL MEETINGS OF SCIENTIFIC SOCIETIES

The annual meeting of the British Association for the Advancement of Science for 1924 will be held at Toronto, August 6 to August 13. Programs of this meeting have been sent to the Secretaries of all Sections.

The last previous meeting held in North America was at Winnipeg in 1909. Active measures are being taken both in Toronto and in England with the object of insuring that the meeting shall afford an exceptional opportunity for intercourse between British, Canadian, American, and European workers in science. In the case of members of this

Society who are intending to attend this meeting in any capacity the Secretary desires to be informed.

The meeting of the American Association for the Advancement of Science is to be held in Washington, D. C., December 27, 1924, to January 3, 1925. During this period it is now expected that the Society of American Foresters will also hold its annual meeting. The Committee in Charge includes D. T. Mason, Chairman; I. F. Eldredge, and R. C. Hall.

On March 13, 1924, Mr. Joseph E. Abbott, Division Fire Warden, Department of Conservation and Development, New Jersey, died suddenly of appoplexy. Mr. Abbott had been a Member of the Society since 1923.

A Comprehensive Inventory of the Forests of the World

"As a guide to the forest resources of the nations and the world, as an analysis of the factors affecting the development of forest policies, and as a record of the progress of forest conservation in different countries, this book will have unique value to economists, administrators, foresters, exporters, importers, and users of forest products."—Gifford Pinchot.

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VI. The Forest Situation in South America.
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IX. Forest Resources Other Than Timber.

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A graphic presentation of one of the vital economic problems of the day—the securing of an adequate supply of paper.

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8.—Properties of American Pulpwood

TIMBER SUPPLY
9.—Forest Regions
10.—What We Have
11.—Forest Ownership

TIMBER PRODUCTION
12.—The Need for Forestry
13.—The Chance for Forestry
14.—The Methods of Forestry
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16.—The Cost of Forestry
17.—The Responsibility for Forestry
18.—What Should Be Done

A PERMANENT PULP AND PAPER INDUSTRY
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